EMTL-FINAL REPORT NO. 1491
FMI-EMTL-W/A NO. 3078

FINAL REPORT

HUMIDITY EFFECTS ON SOLUBLE CORE MECHANICAL AND THERMAL PROPERTIES (POLYVINYL ALCOHOL/MICROBALLOON COMPOSITE)

BY

THE ENERGY MATERIALS TESTING LABORATORY
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PURCHASE ORDER NO. 100364

JANUARY 5, 1993

Energy Materials
Testing Laboratory

A DIVISION OF FIBER MATERIALS, INC.
BIDDEFORD INDUSTRIAL PARK, BIDDEFORD, ME. 04005

TM04533
05 JAN 1993

Lockheed

ASRM DEVELOPMENT TEST PLAN
HUMIDITY EFFECTS ON SOLUBLE CORE MECHANICAL AND THERMAL PROPERTIES
VOLUME I

Contract No. NAS8-37800

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1.0 INTRODUCTION

This document constitutes the final report for the study of humidity effects and loading rate on soluble core (PVA/MB composite material) mechanical and thermal properties under Contract No. 100364. This report describes test results, procedures employed, and any unusual occurrences or specific observations associated with this test program.

This effort was performed by the Energy Materials Testing laboratory (EMTL), a division of Fiber Materials, Inc. (FMI), 5 Morin Street, Biddeford Industrial Park, Biddeford, Maine. Technical questions regarding the report can be directed to the principle investigator Glenn Vaillancourt. The contract administrator for this program was David Audie.

2.0 OBJECTIVE

The primary objective of this work was to determine if cured soluble core filler material regains its tensile and compressive strength after exposure to high humidity conditions and following a drying cycle. Secondary objectives include measurements of tensile and compressive modulus, and Poisson's ratio, and coefficient of thermal expansion (CTE) for various moisture exposure states. [1]

3.0 PURPOSE

The proposed facility for the manufacture of soluble cores at the Yellow Creek site incorporates no capability for the control of humidity. Recent physical property tests performed with the soluble core filler material showed that prolonged exposure to high humidity significantly degradates in strength. The purpose of these tests is to determine if the product, process or facility designs require modification to avoid imparting a high risk condition to the ASRM.[1]

4.0 PASS/FAIL CRITERIA

The material tensile and compressive ultimate strength shall return to within one standard deviation of the baseline ultimate strength after exposure to high humidity conditions followed by a drying cycle at comparable cross-head speeds. CTE measurements are required to support engineering analyses. [1]

5.0 SCOPE

In summary, EMTL performed the following tasks:

- o Purchased the required materials for specimen fabrication.
- o Fabricated molds and test fixturing.
- o Mixed, molded, and cured the tensile, compressive and CTE specimens.
- o Aged the test specimens.
- o Tested the specimens.
- o Submitted final test report.

Tensile and compressive test were conducted to determine the effects of high humidity (90%) and strain rates (0.05, 0.25, 2.0 in/min) on the tensile and compressive strength, modulus and Poisson's ratio of the material. These test also determined if cured soluble core filler material regains its tensile and compressive strength and modulus after exposure to high humidity conditions and following a drying cycle. The drying cycle of 16±2 hours represents the soluble core barrier cure cycle presently incorporated into the process.

EMTL conducted 32 tensile and 32 compressive tests at room temperature after high humidity aging, after high humidity aging then drying, and immediately after cure test conditions. Table 1 specifies the aging temperature, humidity level, drying time, rate of testing, and number of tests that were conducted at each condition.

EMTL also conducted 40 CTE tests after high humidity aging, after high humidity aging then drying, immediately after cure, and after a week under laboratory ambient conditions. Table 2 specifies the aging temperature, humidity level, drying time, method of testing, and number of tests that were conducted at each condition.

Thermal expansion measurements were performed over the range 70°F to 250°F. Thermal Expansion was measured continuously over this range.

TABLE 1
TENSILE AND COMPRESSIVE SPECIMEN AGING CONDITIONS AND TEST MATRIX

QTY COMP	QTY TEN	AGING TEMP (^oF)	AGING RH (%)	AGING DURATION (hrs)	DRYING TIME AT 180^oF (HRS)	CROSSHEAD SPEED (in/min)
4	4	90±5	90±10	120±12	none	0.05
2	2	90±5	90±10	120±12	none	0.25
2	2	90±5	90±10	120±12	none	2.0
8	8	90±5	90±10	120±12	16±2	0.05
4	4	90±5	90±10	120±12	16±2	0.25
4	4	90±5	90±10	120±12	16±2	2.0
4	4	-	-	-	-	0.05
2	2	-	-	-	-	0.25
2	2	-	-	-	-	2.0

TABLE 2
THERMAL EXPANSION SPECIMEN AGING CONDITIONS AND TEST MATRIX

QTY CTE	AGING TEMP (^oF)	AGING RH (%)	AGING DURATION (HRS)	DRYING TIME AT 180^oF (HRS)	SPECIMEN SIZE
8	90±5	90±10	120±12	NONE	7"L x.75"D
8	90±5	90±10	120±12	16±2	7"L x.75"D
8	70±5	<50	170±12	-	7"L x.75"D
8	-	-	-	-	7"L x.75"D
8	-	-	-	-	2"L x.25"SQ

6.0 SPECIMEN MIXING

The specimen PVA/MB mixture was formulated by weight in the following percentages from the following materials.

75% Microballoons - Extendospheres SG - Hollow Microspheres, from PQ Corp. See appendix for certificate of analysis.
10% Water
10% Ethanol - Alcohol, Anhydrous, Reagent. Specially Denatured Alcohol Formula 3A, from VWR.
5% Polyvinyl Alcohol - Airvol 205, from Air Products.

Several replicate 5.5 lb batches of this mixture were made during the course of the program. The binder solution for the mixture was made by combining 250±5 grams of tap water with 250±5 grams of denatured ethanol in a liter beaker. This water ethanol mixture was heated to 130° ± 5°F and agitated on a magnetic stirring hot plate. 125±2 grams of polyvinyl alcohol (PVA) crystals were slowly added to the heated mixture and agitated until the PVA crystals were fully dissolved.

1875±25 grams of microballoons were premeasured and placed into an airtight 10 liter wide mouth container. The microballons were slowly stirred by hand, with a spatula, while the binder solution was added. Hand mixing continued for approximately 5 minutes until a homogeneous PVA/MB consistency was obtained. If the mixture was not immediately pressed into molds, it was sealed in the air tight container and used within two weeks after mixing or discarded.

Presented in the appendix are the various batch numbers and their corresponding formulation weights.

7.0 SPECIMEN MOLDS

All specimens were cast from PVC or aluminum molds dependent on the specimen type. The internal surfaces of all molds were sprayed with several coats of FREKOTE NO.1 mold release manufactured by the Dexter Corporation. The top of all molds were kept open to provide a vapor path for the water/ethanol. Each mold was firmly packed using a low density tamper (graphite or glass phenolic rod), and compressing approximately two to three times the volume of PVA/MB material into the molds.

The tensile mold was made of aluminum as per EMTL's drawing # EMC-3915. Reference Figure 1 for the tensile mold drawing.

The compression molds were made of PVC pipe, 3"±0.0625" diameter by 7" long faced off to length so that the centerline of the pipe was perpendicular to the bottom edge of the pipe. One end of the pipe was covered with a solid flat plate and the opposite end of the pipe was covered with a plate that had a 3" cylindrical hole. The pipe was held between these plates with 4 bolts. The hole in the top plate allowed filling and packing of the mold. This compression mold assembly was easily assembled and disassembled easing the filling, packing, and specimen removal operation. Reference Figure 2, EMTL DWG# EMC-3929, for the compressive mold drawing.

The CTE molds were made of aluminum as per EMTL's drawing # EMC-3925. Reference Figure 3 for the CTE mold drawing.

Reference Figure 4 for a photograph of the tensile and compressive molds, mixing of the binder solution, and the curing oven.

FIGURE 1

TENSILE SPECIMEN MOLD DRAWING

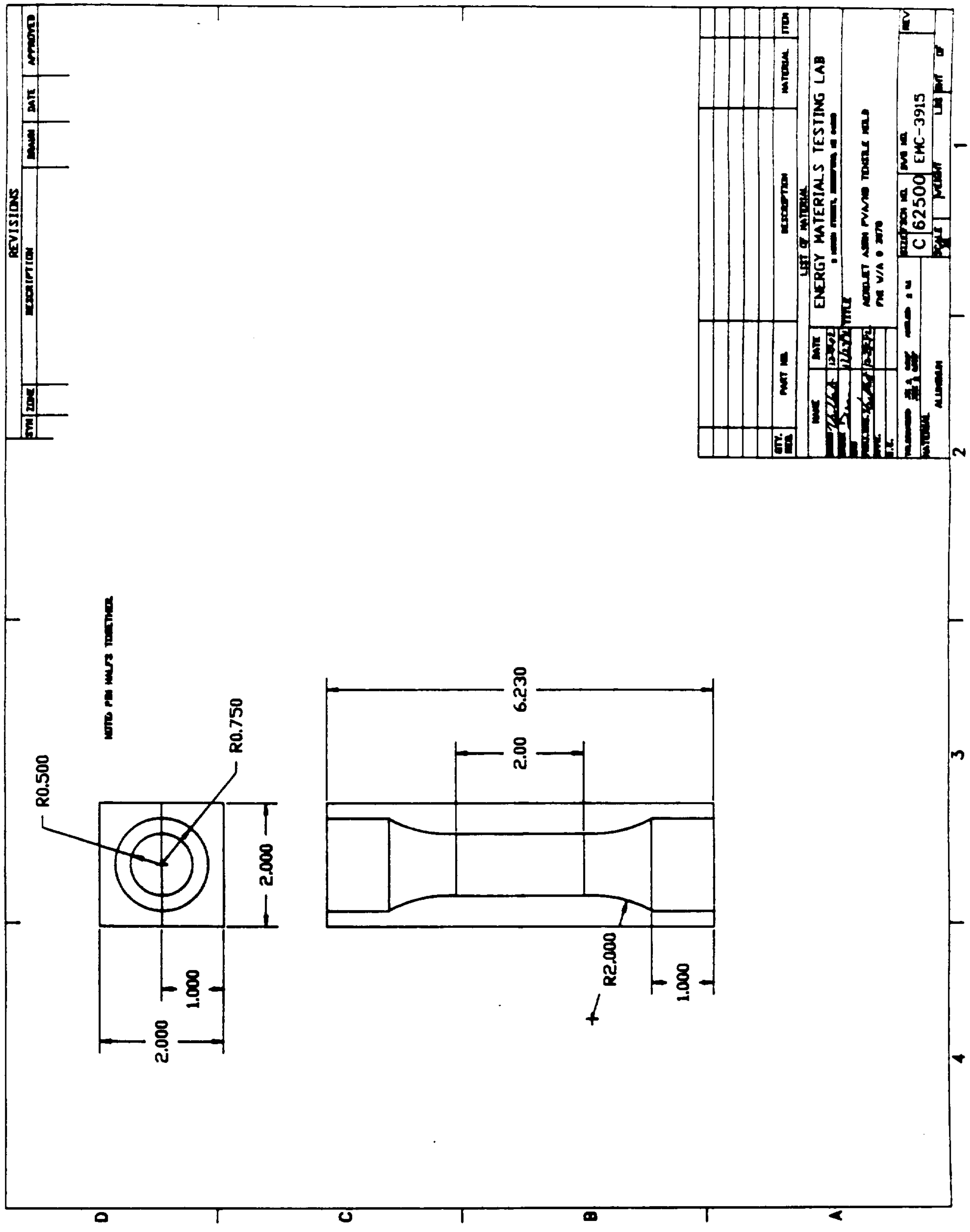


FIGURE 2
COMPRESSIVE SPECIMEN MOLD DRAWING

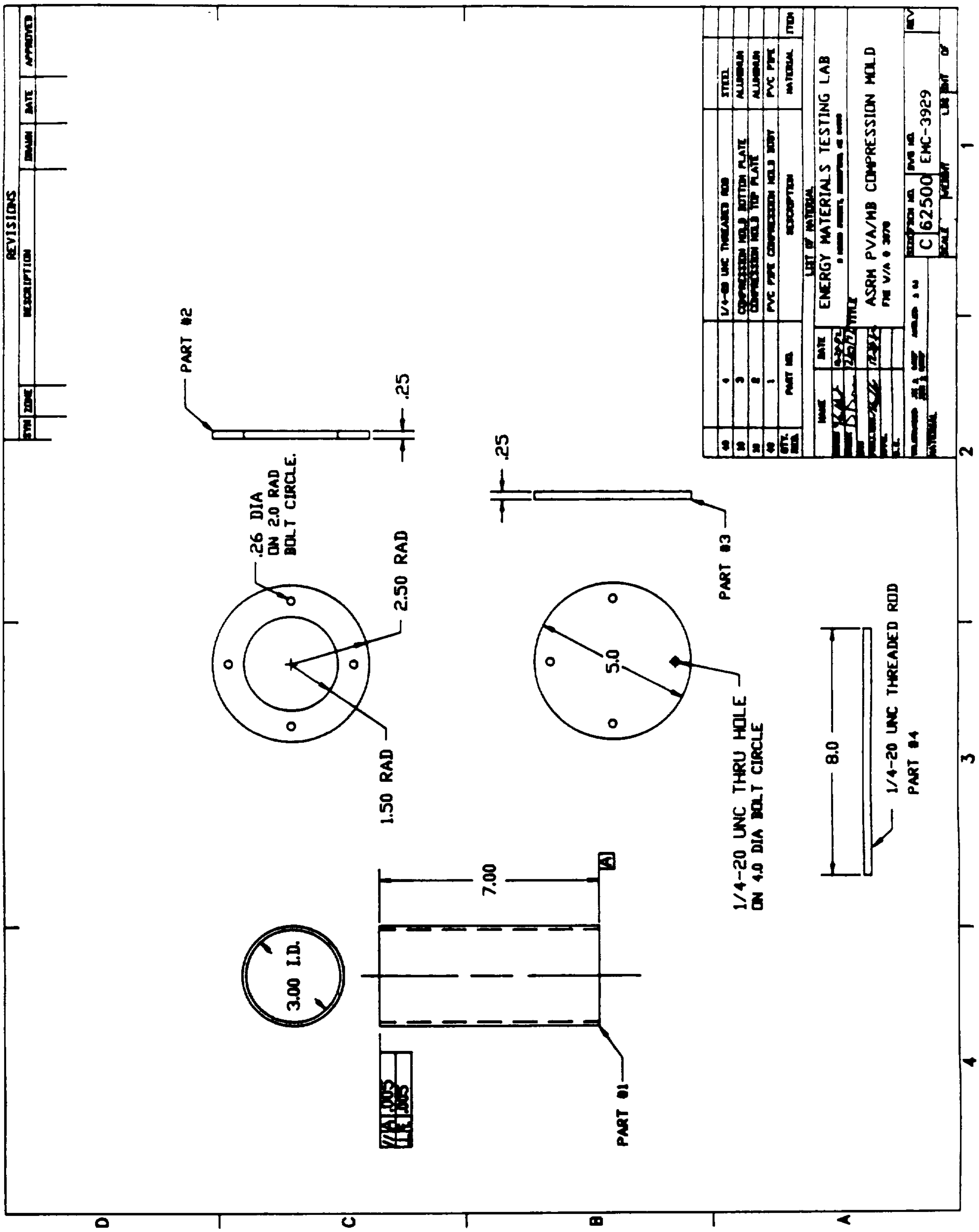


FIGURE 3

CTE SPECIMEN MOLD DRAWING

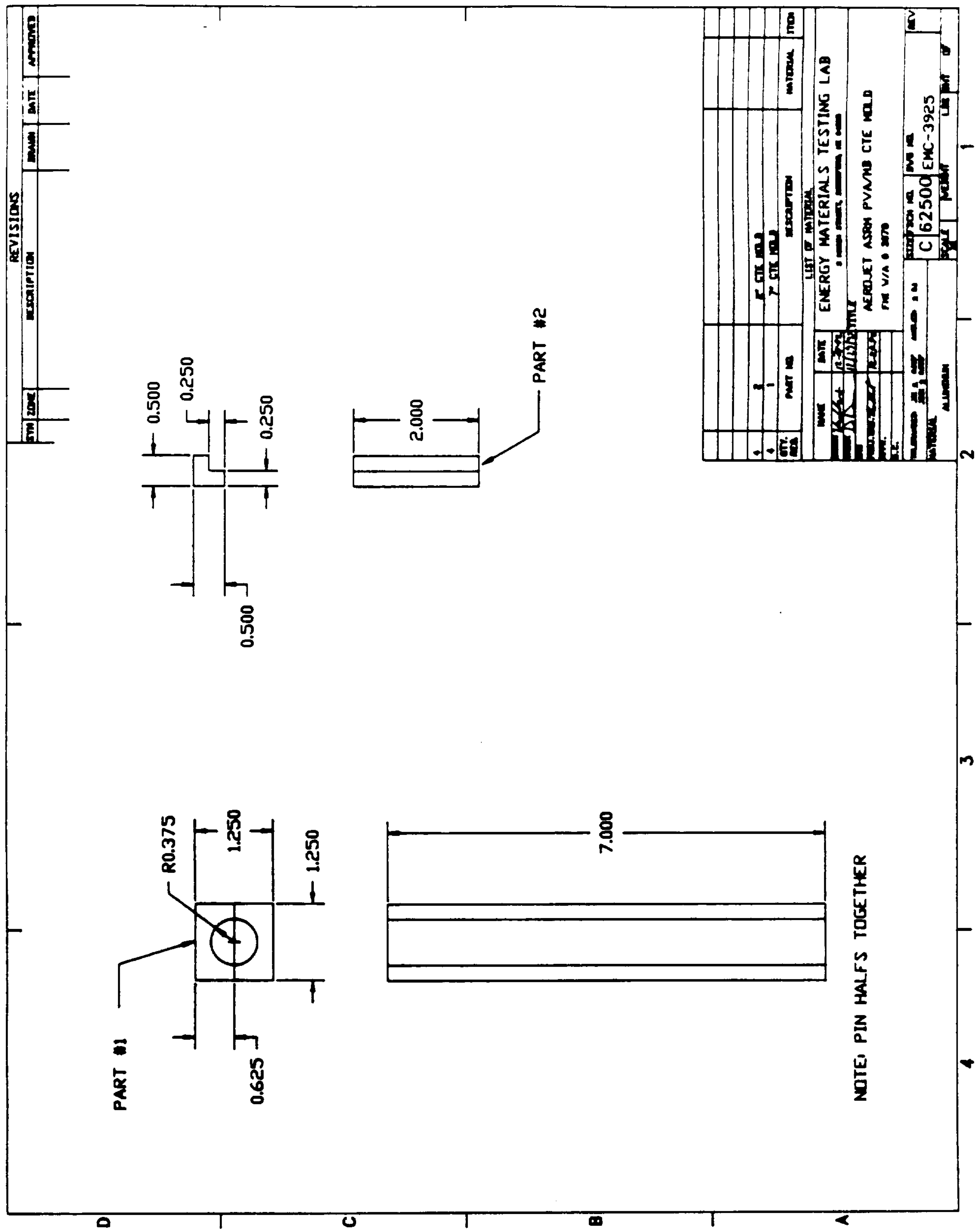
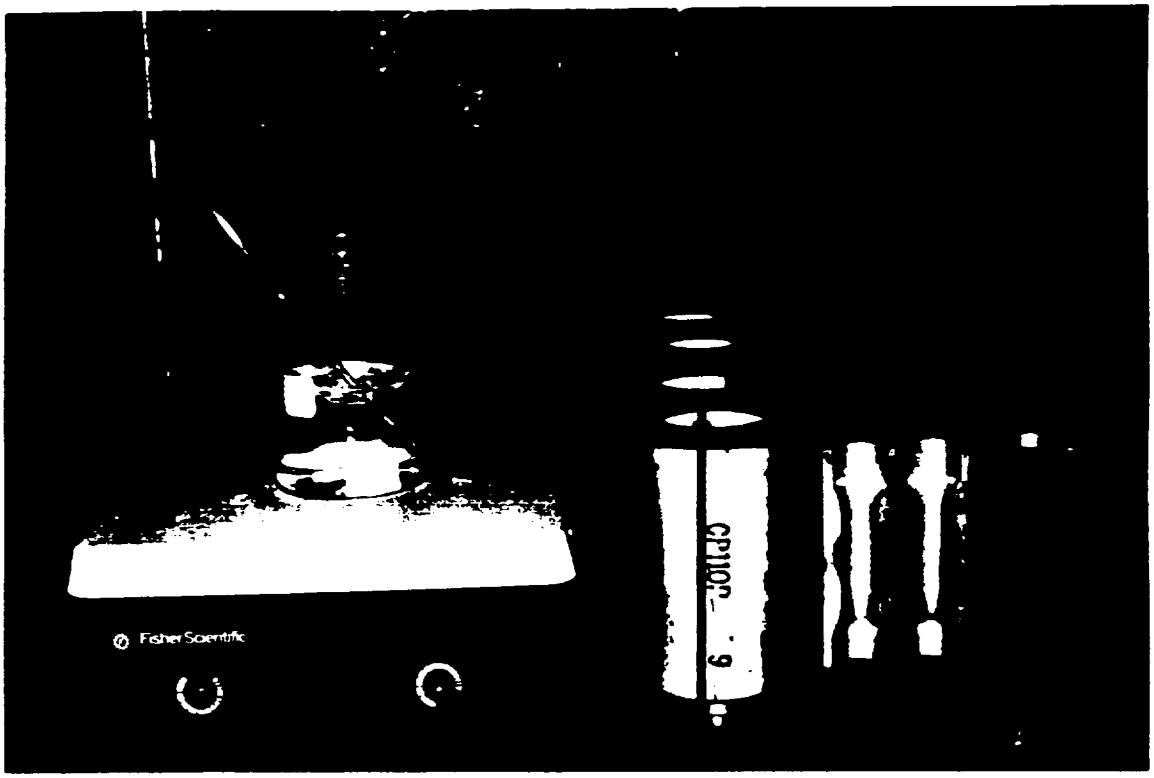
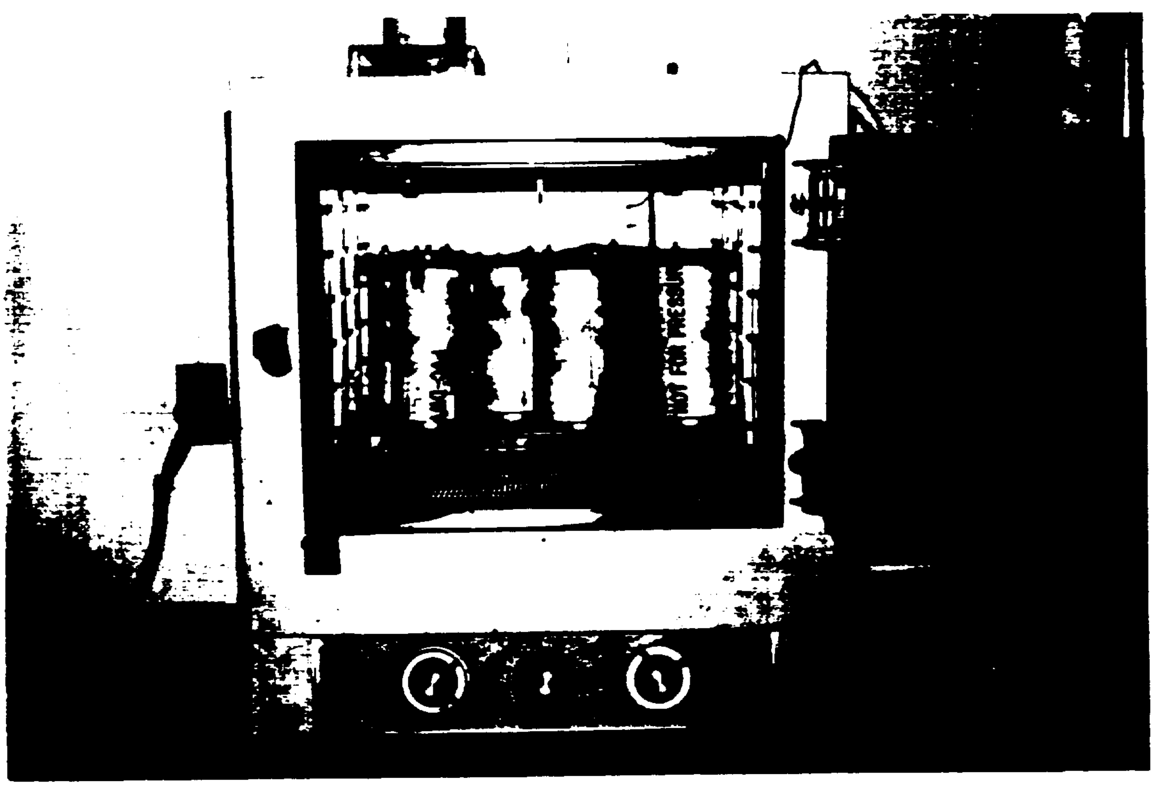


FIGURE 4
PHOTOGRAPH OF TENSILE AND COMPRESSIVE MOLDS,
MIXING OF BINDER SOLUTION AND CURING OVEN





8.0 SPECIMEN CURING

All samples were cured in the same oven at 250°F. The tensile and CTE samples were cured for a minimum of 6 hours. The compression samples were cured for a minimum of 9 hours. Strip chart records of cure temperature vs time relating to specimen type and number are presented in the appendix. Tabulations of the date and time the specimens were placed into and removed from the curing oven are summarized in the appendix.

The specifications for the drying oven were outlined in a sub-specification of ASTM C495, ASTM C88. The oven was to be capable of being continually heated at 230±9°F for 4 hours and the rate of evaporation, at this range of temperature, was to be at least 25g/hr. The rate determined for this oven was 27.6g/hr. This rate was determined from the water loss from five 1 liter low-form beakers, each containing 500g of water at 70±3°F, placed at each corner and the center of the oven. The results of this evaporation determination are presented in Table 3.

TABLE 3
DRYING OVEN EVAPORATION RATE DETERMINATION PER ASTM C88

BEAKER NO.	WEIGHT EMPTY (g)	WEIGHT FULL (g)	WEIGHT AFTER 4 HRS AT 230°F (g)	EVAPORATION RATE (g/hr)
1	303.1	803.6	695.3	27.1
2	309.1	809.3	662.9	36.6
3	297.1	797.8	693.7	26.0
4	409.5	909.6	802.6	26.8
5	408.8	908.9	800.2	27.2

Note: Evaporation rate must be >25g/hr. AVE = 26.7g/hr
Date: 4/20/92, Time in 13:05, Time out 17:05

9.0 SPECIMEN PREPARATION

Each specimen, as it is removed from the molds was assigned a unique identification. The specimen identification system that was employed in this program was as follows:

TEN-75°F-90 -0.05-1

Replicate Number

Crosshead Speed (in/min)
0.05
0.25
2.0
N/A for CTE

Aging Humidity Level (%)
50
90
Dry

Test Temp (°F)
75
N/A for CTE

Type of Evaluation
TEN-Tension
CMP-Compression
CTE-Thermal Expansion

After the compression specimens were removed from the molds, the end of the samples corresponding to the open end of the mold required machining to remove the rough surfaces left by the filling process. All compression samples were ground in the FMI machine shop to their final dimensional requirements. Finish machined specimens were weighed, and the post cured gravimetric density in air calculated per ASTM-C559 to an accuracy of 1% or better. The tensile and CTE specimens did not require any machining after removal from the molds. The tensile and CTE specimens were also dimensioned and weighed.

All of the samples underwent visual inspection for cracks, voids, discolorations, inclusions, irregularities, and surface porosity. Flawed specimens were excluded from further processing.

10.0 STORAGE AND AGING OF SPECIMENS

Baseline (Post Cured, Dry) Samples:

After the cure cycle, the baseline compression samples were cooled in a desiccated, sealed chamber at ambient temperature for 6 hours minimum prior to final machining. After machining the ends of the specimens flat and parallel, these samples were reheated to 250°F for 4 hours to remove any moisture that might have been absorbed during the time they were out of the desiccator. After the redrying cycle, the baseline compression samples were cooled again in a desiccated, sealed chamber at ambient temperature for 6 hours minimum prior to testing. Testing was conducted within five minutes after removal of the specimens from the cool-down chamber.

After the cure cycle, the baseline tensile and CTE samples were cooled in a desiccated, sealed chamber at ambient temperature for 6 hours minimum prior to testing. Unlike the compression samples, these tensile and CTE samples required no further preparation. Testing was conducted within five minutes after removal of the specimens from the cool-down chamber.

High Humidity Aged Samples:

High humidity aging at 90%RH, 90°F was accomplished with a humidity chamber. The humidity level and temperature inside the chamber was monitored daily through the use of dry and wet bulb thermometer measurements to determine the relative humidity and temperature inside the chamber. Tables of the humidity level, wet and dry bulb measurements and dates are in the appendix. These samples were weighed immediately after removal from the high humidity chamber to determine the wet density of the samples after high humidity conditioning. Testing was conducted within five minutes after removal of the specimens from the humidity chamber.

High Humidity Aged/Dried Samples:

After high humidity aging, some of the samples were to be dried at 180°F for 16±2 hours. This was accomplished with the same oven used for curing the samples.

After the drying cycle, these samples were cooled in a desiccated, sealed chamber at ambient temperature for 6 hours minimum prior to test. Testing was conducted within five minutes after removal of the specimens from the cool-down chamber.

11.0 TENSILE AND COMPRESSIVE TEST APPARATUS

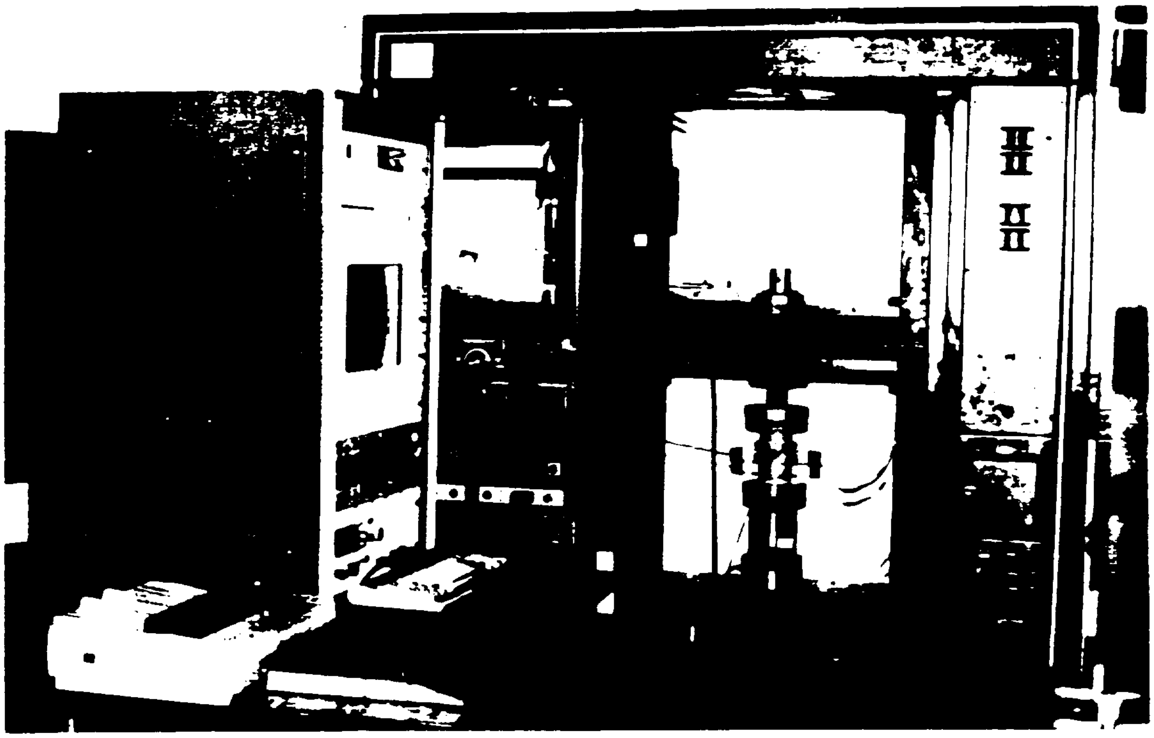
The mechanical test equipment consisted of the following:

- 20,000 lb Electro-Mechanical Test Machine Model 1113.
- 10,000 lb Load Cell.
- 1,000 lb Load Cell.
- Load Cell Conditioner, No. LPM-700-000.
- Compressive Platens.
- Tensile Test Fixtures.
- 10 Channel Strain Gage Conditioner, 2100 System.
- Strain Gages, No. EA-13-10CBE-120, EA-13-250BG-120/LE.
- 12 Inch Vernier, 0.001" Resolution.
- Computerized Data Acquisition 386 System.
- High Humidity Chamber No. C08A-3-10.
- Type K Thermocouples.
- 10 Channel Thermocouple Meter No. 650-KF-A-DSS
- Strip Chart Recorder No. 141/39/31/50
- Balance 4000 gram range No. GT4000.

Note: Two types of analog to digital (A/D) converters were used for these tests. The A/D which provides the cleanest signal has an operational limit of 10 Hz and was used for the tests conducted at 0.05 and 0.25 in/min. In order to acquire data at 25 Hz an A/D which does not take time to filter the signals before transmitting was necessary. The jagged stress vs strain curves, for the 2.0 in/min tests, are due to the use of this "non-filtering" A/D converter.

Figure 5 is a photographic record of the mechanical test facility and the high humidity aging chambers. Figure 6 is a close up view of the tensile and compressive setups. Figure 7 is the tensile test fixture drawing.

FIGURE 5
TENSILE AND COMPRESSIVE TEST FACILITY AND
THE HIGH HUMIDITY AGING CHAMBERS



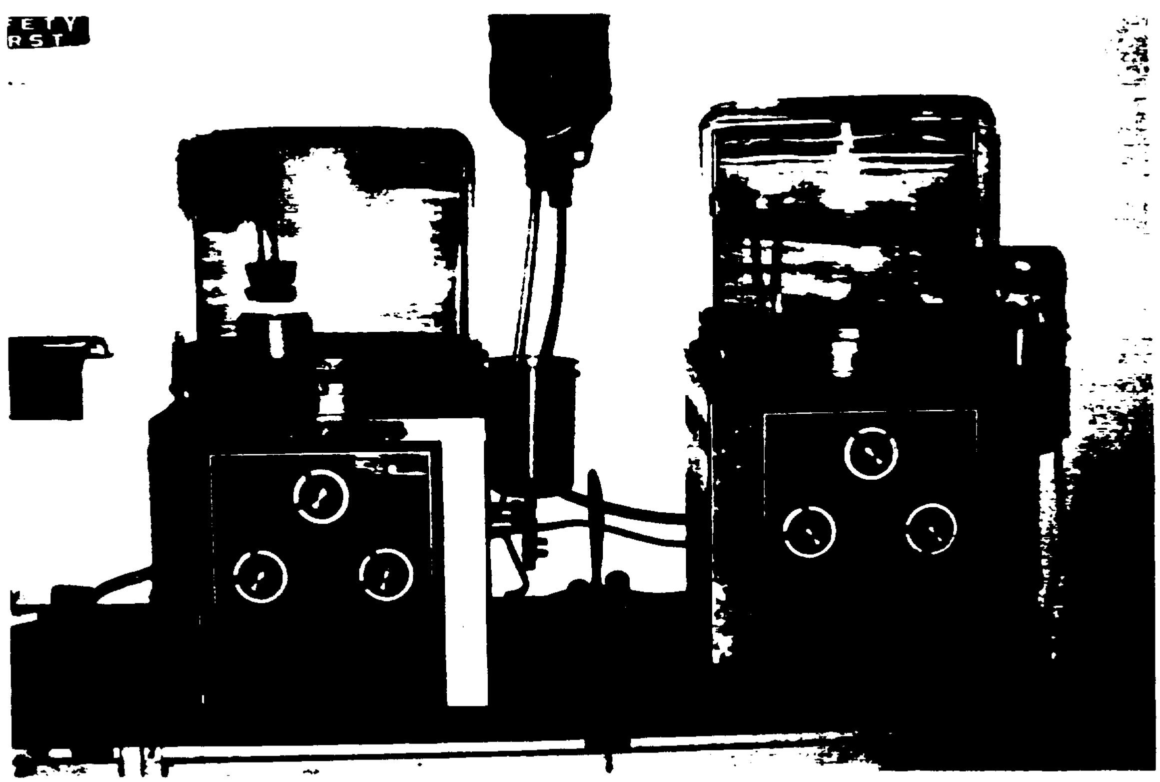
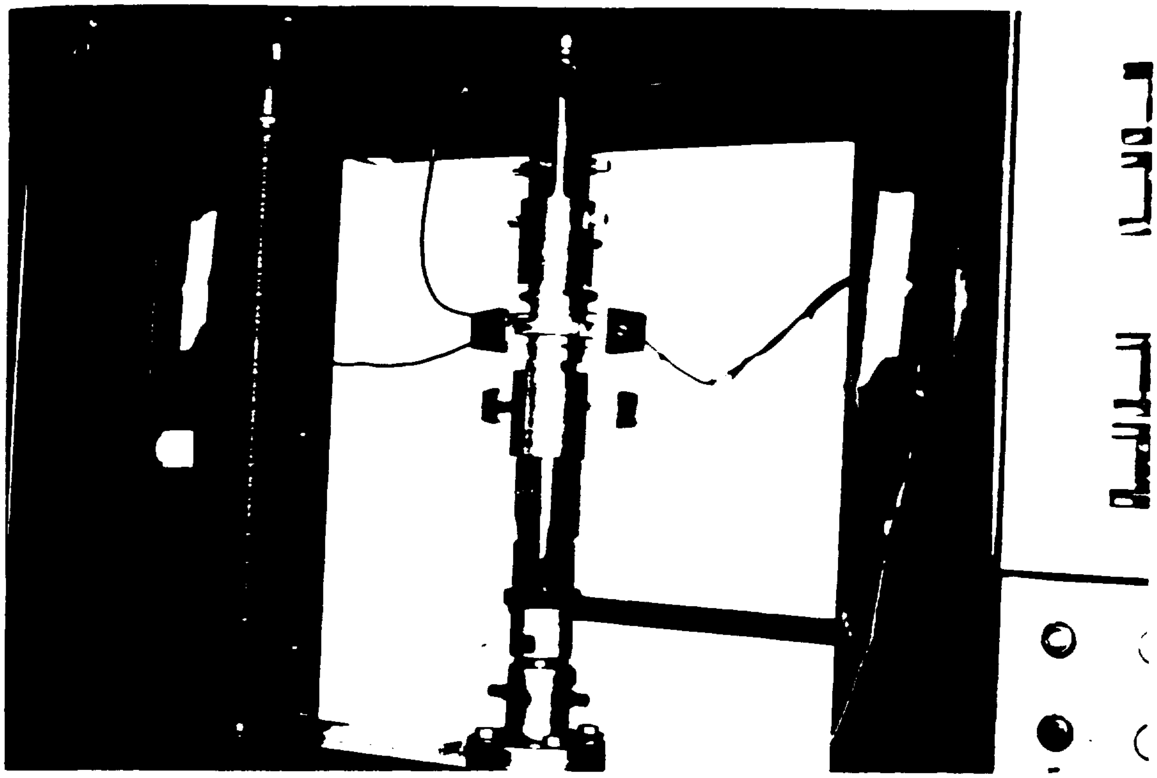


FIGURE 6
CLOSE UP VIEW OF TENSILE AND COMPRESSIVE SETUPS



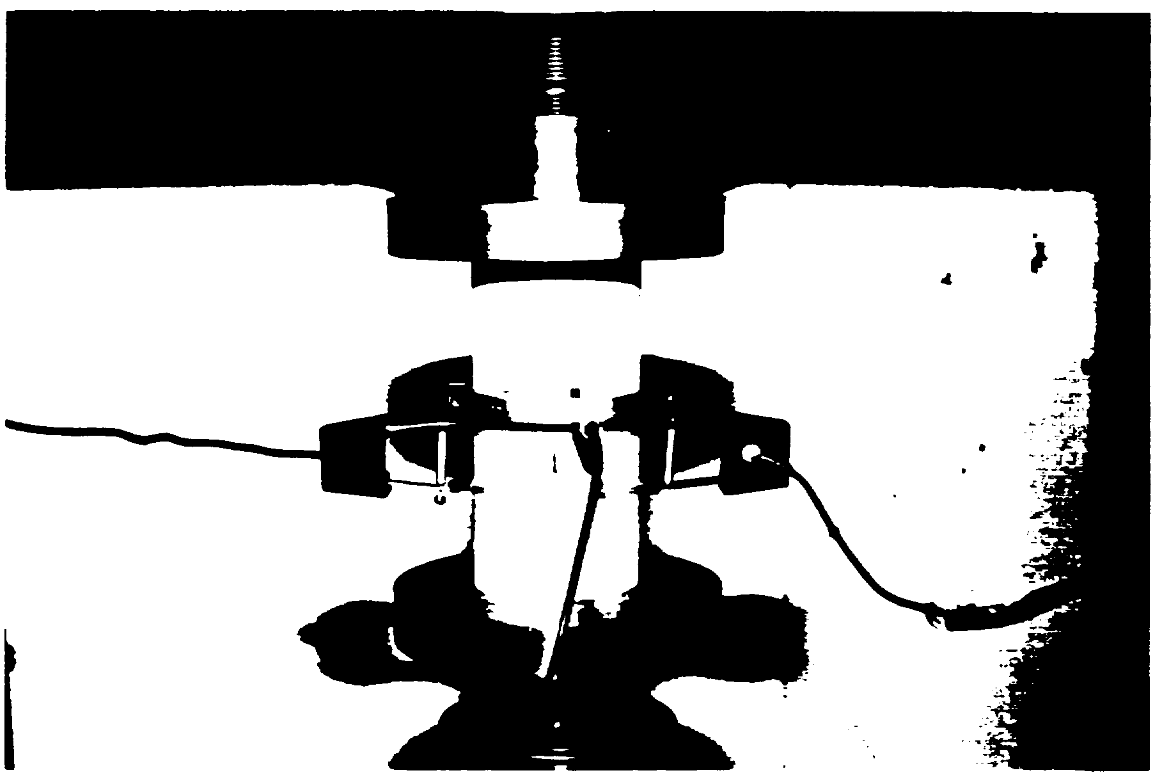
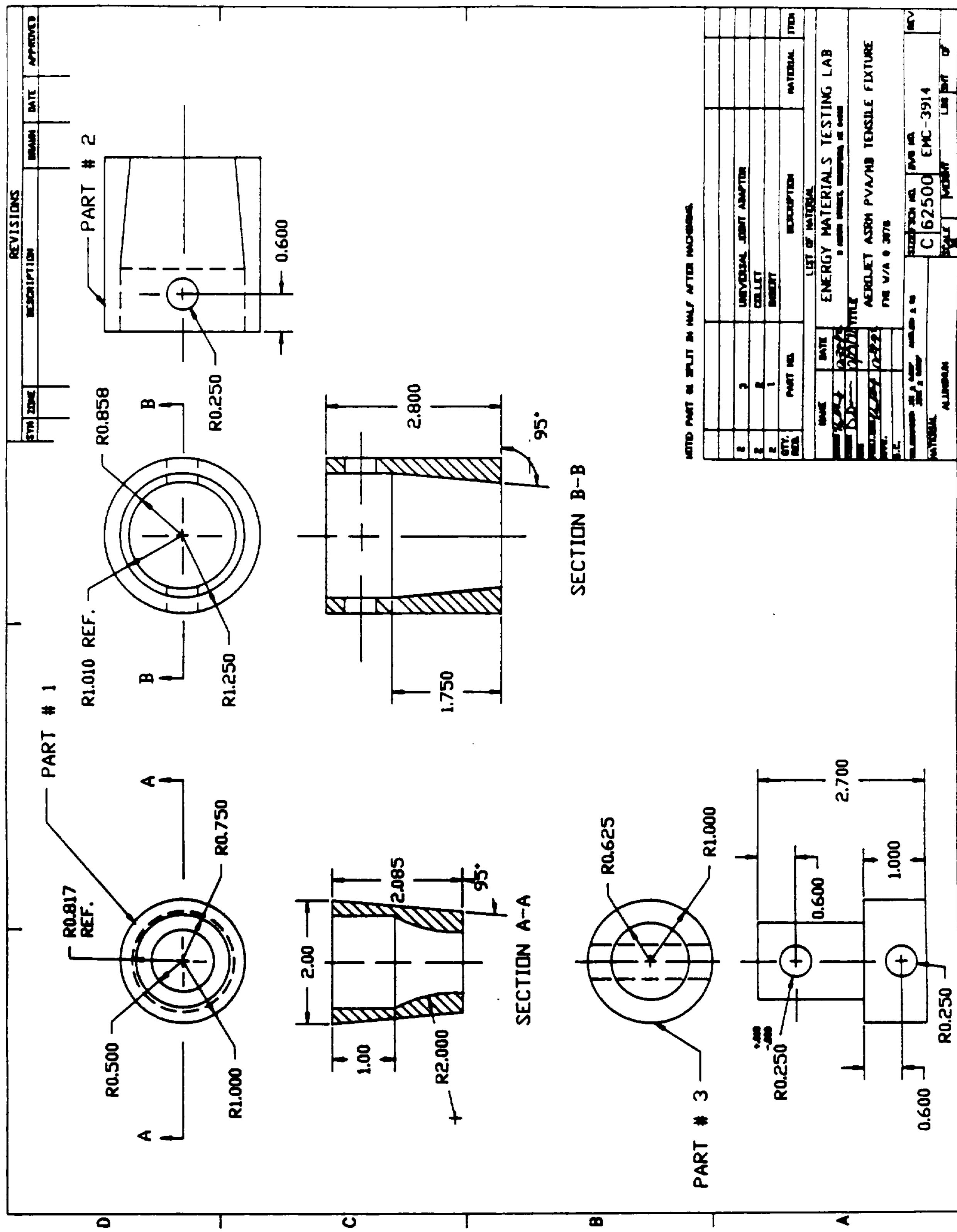


FIGURE 7
TENSILE TEST FIXTURE DRAWING

SKT 9202



12.0 TENSILE AND COMPRESSIVE TEST PROCEDURES

All testing was performed in accordance with the good engineering practices established by the following accepted ASTM procedures and the customers statement of work.

ASTM#	Title
C 31	Method of Making and Curing Concrete test Specimens in the Field.
C 39	Test Method for Compressive Strength of Cylindrical Concrete Specimens.
C 307	Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacing.
C 495	Compressive Strength of Lightweight Insulating Concrete.
C 469	Static Modulus of Elasticity and Poisson's Ratio of Concrete in Compression.
E 4	Practices for Load Verification of Testing Machines.
E 6	Terminology Relating to Methods of Mechanical Testing.
E 29	Indicating Which Places of Figures are to be Considered Significant in Specifying Limiting Values.
E 111	Test Method for Young's Modulus.

Following is a brief description of the tensile and compressive test procedures.

Compression Test Setup and Calibration

A 10,000 lb load cell and compression platens were installed in a universal test machine. The crosshead displacement rate was set at 0.05 in/min and verified with a dial indicator and a stop watch. The load cell, strain gage, extensometer and LVDT signal conditioners were connected to a data acquisition computer via an analog to digital converter. These measurements were monitored and recorded during testing at a sampling rate of 2 Hz for the tests conducted at a crosshead speed of 0.05in/min, 10 Hz for the test conducted at 0.25 in/min and 25 Hz for the tests conducted at 2.0 in/min. Once all data acquisition and test equipment was setup it was calibrated before any tests were conducted. The load cell was calibrated initially with a proofing ring traceable to NIST. During this calibration, a shunt-calibration was also determined. This shunt calibration was checked before each run to ensure that the calibration did not change during the course of the program. Additionally, calibrated dead weights were placed on the load cell to verify the load cell response. The strain gages signals were calibrated with a shunt resistor. The extensometers were calibrated with an extensometer calibrator. The LVDT was calibrated with a LVDT calibrator.

Prior to actual specimen testing, a graphite qualification specimen was tested to verify compressive platen alignment. This specimen was instrumented with axial 4 strain gages located at 90° to each other around the specimens gage section. The specimen was placed between the compression platens and loaded to 50% of its yield strength. The four gages were monitored during testing. Their output signals were recorded and used to determine the amount of bending, if any, induced into the specimen. This compressive setup was adjusted until it introduced less than 5% bending into the specimen.

This graphite specimen was also used to qualify the axial extensometers and the transverse LVDT that would be used to measure strain on the PVA/MB samples. A transverse strain gage was added to the graphite qualification sample. The two axial extensometers were place 180° to each other over two of the axial strain gages. The transverse LVDT was positioned around the circumference of the sample at mid height, near the transverse strain gage. The graphite specimen was loaded to 50% of its yield strength. The axial and transverse strain gage readings were compared to the axial and transverse extensometer and LVDT readings. All strain measurements were in agreement and the results of this test are presented in the appendix.

PVA/MB Compression Specimen Testing

The PVA/MB compression specimens were tested in accordance with ASTM C495-86 and the statement of work. Two axial extensometers were place on the specimen 180° from each other at the samples mid height. The transverse LVDT was positioned around the circumference of the sample just above the extensometers.

For the specimens conditioned at high humidity, compression testing was conducted at room temperature within five minutes after removal of the specimens from the high humidity chamber. For the samples conditioned at high humidity, dried at 180°F, then cooled to RT in a desiccated chamber, compression testing was conducted at room temperature within five minutes after removal of the specimens from the cool down chamber. For the baseline specimens, after the redrying cycle following final machining, the samples were cooled to RT in a desiccated chamber for 6 hours minimum prior to testing. Compression testing was conducted within five minutes after removal of the specimens from the cool-down chamber.

Plots of stress vs strain were generated for each test and used to calculate modulus and Poisson's ratio. The maximum load obtained during testing was determined from the data printout sheets and used to calculate ultimate compressive strength.

Tensile Test Setup and Calibration

A 1,000 lb load cell and tensile test fixtures were installed in a universal test machine. The crosshead displacement rate was set at 0.05 in/min and verified with a dial indicator and a stop watch. The load cell, strain gage, extensometer and LVDT signal conditioners were connected to a data acquisition computer via an analog to digital converter. These measurements were monitored and recorded during testing at a sampling rate of 2Hz for the tests conducted at a crosshead speed of 0.05in/min, 10Hz for the test conducted at 0.25 in/min and 30hz for the tests conducted at 2.0 in/min. Once all data acquisition and test equipment was setup it was calibrated before any tests were conducted. The load cell was calibrated initially with a proofing ring traceable to NIST. During this calibration, a shunt-calibration was also determined. This shunt calibration was checked before each run to ensure that the calibration did not change during the course of the program. Additionally, calibrated dead weights were hung from the load cell to verify the load cell response. The strain gages signals were calibrated with a shunt resistor. The extensometers were calibrated with an extensometer calibrator. The LVDT was calibrated with a LVDT calibrator.

Prior to actual specimen testing, a graphite qualification specimen was tested to verify tensile grip alignment. This specimen was instrumented with axial 4 strain gages located at 90° to each other around the specimens gage section. The specimen was placed in the fixtures and loaded to 50% of its yield strength. The four gages were monitored during testing. Their output signals were recorded and used to determine the amount of bending, if any, induced into the specimen. This setup was adjusted until it introduced less than 5% bending into the specimen.

This graphite specimen was also used to qualify the axial extensometers and the transverse LVDT that would be used to measure strain on the PVA/MB samples. A transverse strain gage was added to the graphite qualification sample. The two axial extensometers were place 180° to each other over two of the axial strain gages. The transverse LVDT was positioned around the circumference of the sample at mid height, near the transverse strain gage. The graphite specimen was loaded to 50% of its yield strength. The axial and transverse strain gage readings were compared to the axial and transverse extensometer and LVDT readings. All strain measurements were in agreement and the results of this test are presented in the appendix.

PVA/MB Tensile Specimen Testing

The PVA/MB Tensile specimens were tested in accordance with the statement of work. Two axial extensometers were place on the specimen 180° from each other at the samples mid height. The transverse LVDT was positioned around the circumference of the sample between the extensometer arms.

For the specimens conditioned at high humidity, tensile testing was conducted at room temperature within five minutes after removal of the specimens from the high humidity chamber. For the samples conditioned at high humidity, dried at 180°F, then cooled to RT in a desiccated chamber, tensile testing was conducted at room temperature within five minutes after removal of the specimens from the cool down chamber. For the baseline specimens, after the redrying cycle following final machining, the samples were cooled to RT in a desiccated chamber for 6 hours minimum prior to testing. Tensile testing was conducted within five minutes after removal of the specimens from the cool-down chamber.

Plots of stress vs strain were generated for each test and used to calculate modulus and Poisson's ratio. The maximum load obtained during testing was determined from the data printout sheets and used to calculate ultimate tensile strength.

13.0 TENSILE AND COMPRESSIVE TEST DATA REDUCTION

The results that were calculated for mechanical tests included Ultimate Tensile and Compressive Strength, Modulus, and Poisson's Ratio.

- o Ultimate Strength of the matdrial was calculated from the equation: US = P/A, where:

  US = Ultimate Strength (psi)
  P = Maximum load obtained during testing (lbs)
  A = Cross-sectional area (in^2)

- o Modulus of Elasticity was determined by drawing a tangent line on top of the initial linear portion of the axial stress/strain curve. The slope of this line represents the modulus of the material and was calculated from the equation: $E = \Delta\sigma/\Delta\epsilon$, where:

  E = Modulus of Elasticity (psi)
  $\Delta\sigma$ = Linear Increase in Stress (psi)
  $\Delta\epsilon$ = Linear Increase in Strain ($\mu\epsilon$)

- o Poisson's Ratio is equal to the ratio of transverse strain to axial strain over the same increment of stress.

Note: Ultimate compressive strength was defined as the first drop in load, usually coinciding with a loud snap. All of the compression tests were continued past this first drop in load. Most of compression samples never loaded above the first load drop value. However, some of the compression samples reloaded above the first drop in load value. All of the ultimate compressive strength data was reported at the first drop in load value.

The volume of the tensile specimens was calculated as follows:

Density 6061 aluminum = 0.098 lb/in^3.
Average weight of the 4 tensile molds = 1.737 lbs.
Therefore, volume of alum in the mold = $\frac{1.737\,\text{lbs}}{0.098} \frac{in^3}{\text{lbs}} = 17.724\ in^3$

Volume of a solid mold based on surface dimensions is = 24.92 in^3

Therefore, the missing volume (volume of tensile specimen) = 24.92 in^3 - 17.724 in^3 = 7.196 in^3 =117.9 cm^3.

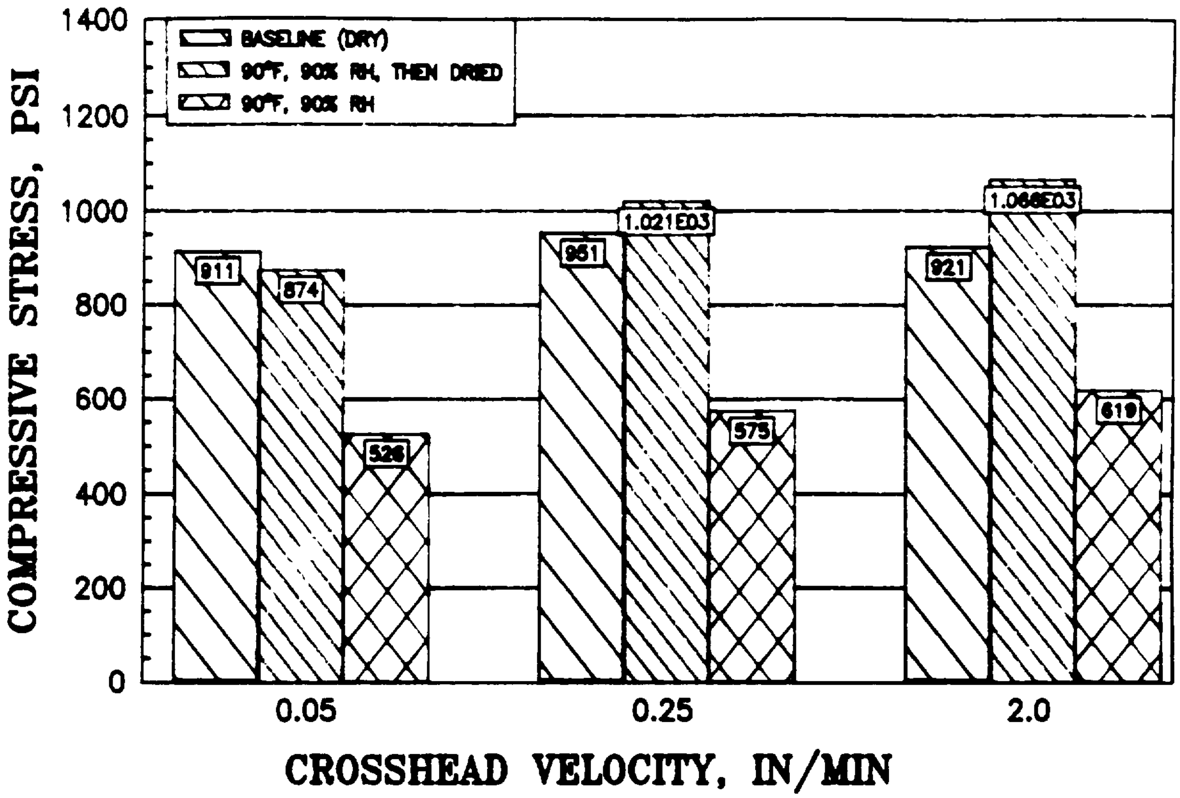
14.0 TENSILE AND COMPRESSIVE TEST RESULTS

The effect of humidity and loading rate on tensile and compressive properties is graphically summarized in Figures 8 through 10. The effects of humidity and loading rate are also presented in tabular form in Tables 4 and 5. Tabulations of the individual values are presented in Tables 6 through 23.

Tabulations of individual batch formulations, individual cure/aging dates and times, individual dimensional measurements, high humidity wet and dry bulb measurements, strip chart records of cure temperature vs time, plots of the high humidity aging conditions, drying cycle temperature vs time plots, and the individual stress vs. strain curves are presented in the appendix.

FIGURE 8

SUMMARY OF EFFECT OF HUMIDITY AND LOADING RATE
ON TENSILE AND COMPRESSIVE STRENGTH



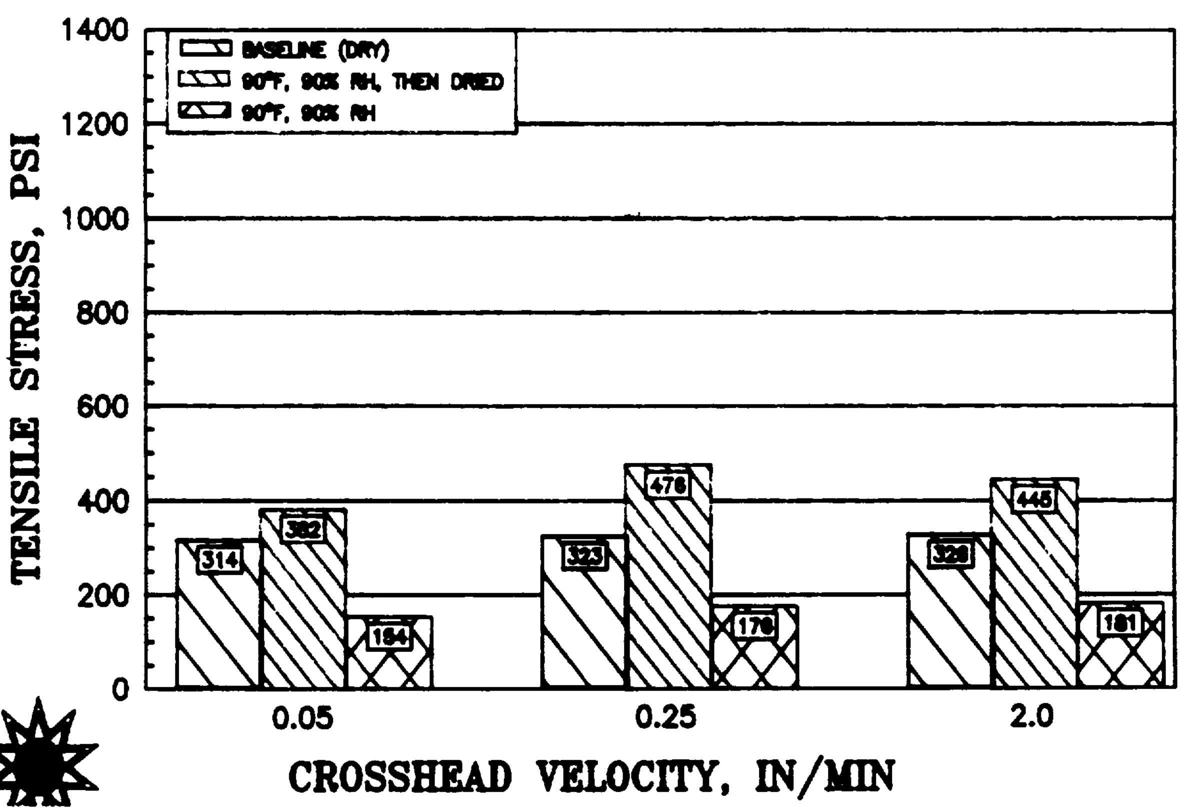


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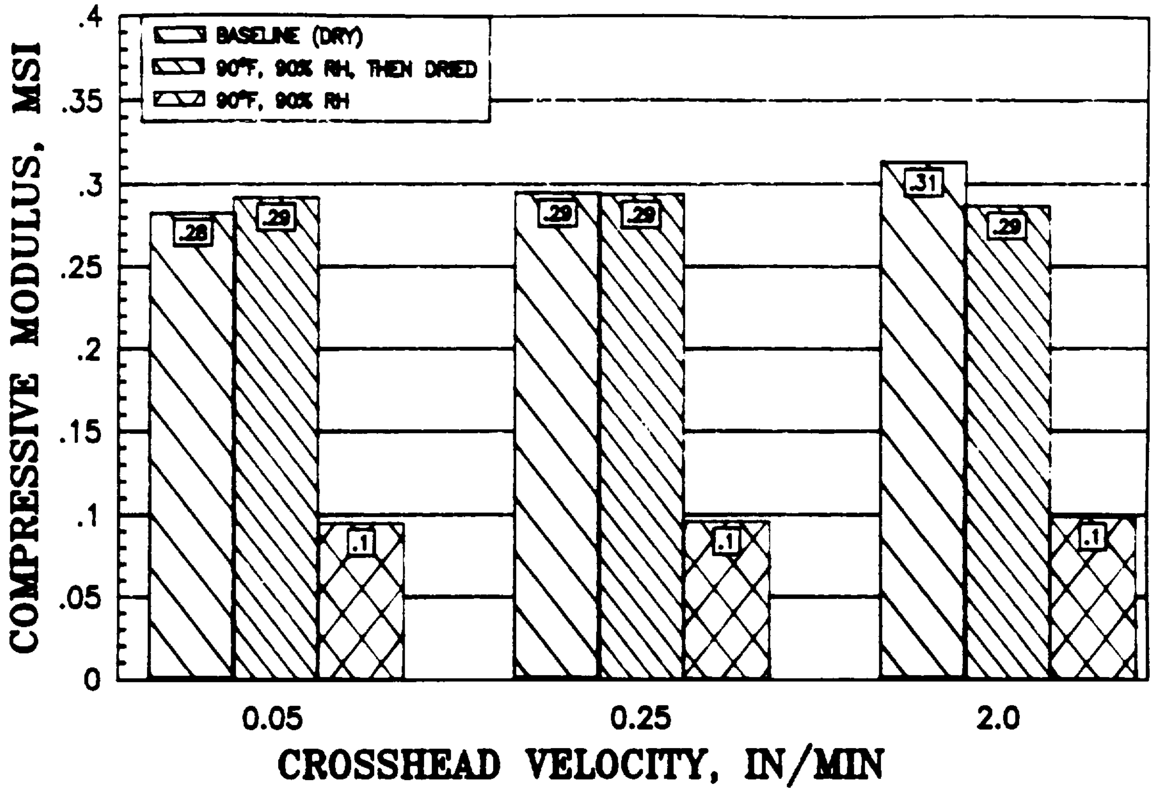
FIGURE 9

SUMMARY OF EFFECT OF HUMIDITY AND LOADING RATE ON TENSILE AND COMPRESSIVE MODULUS



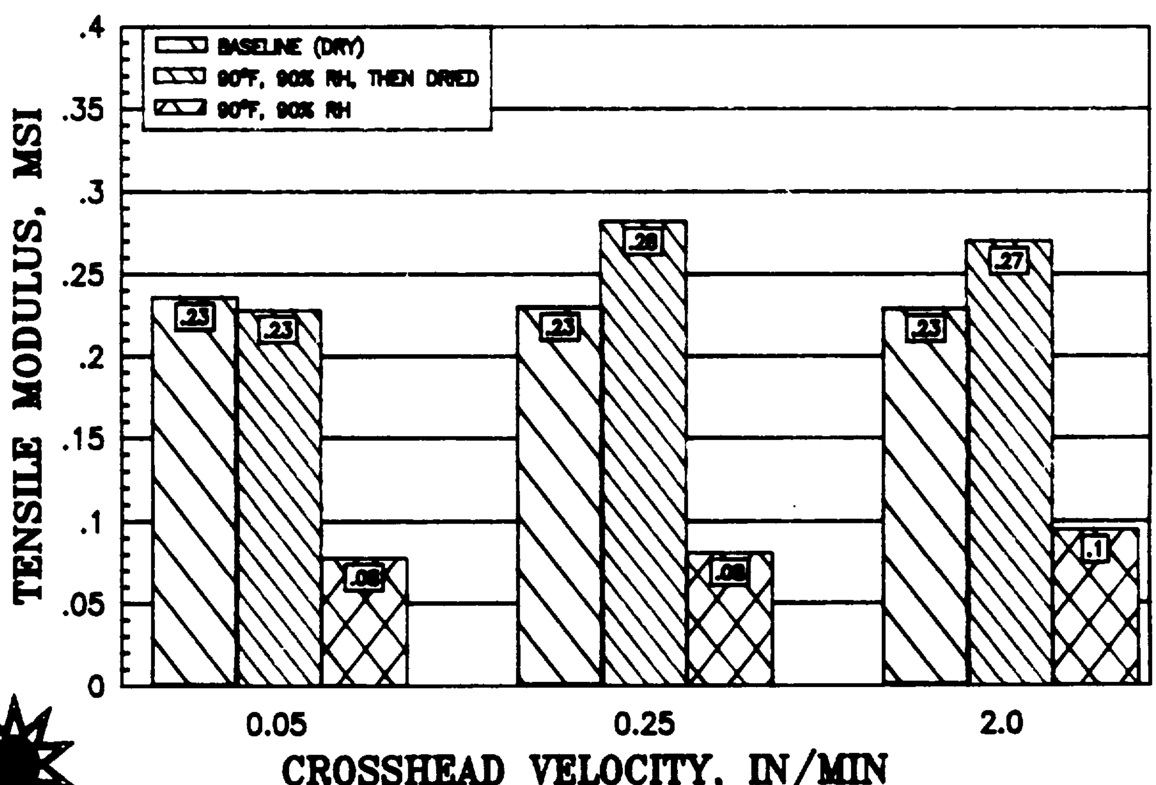


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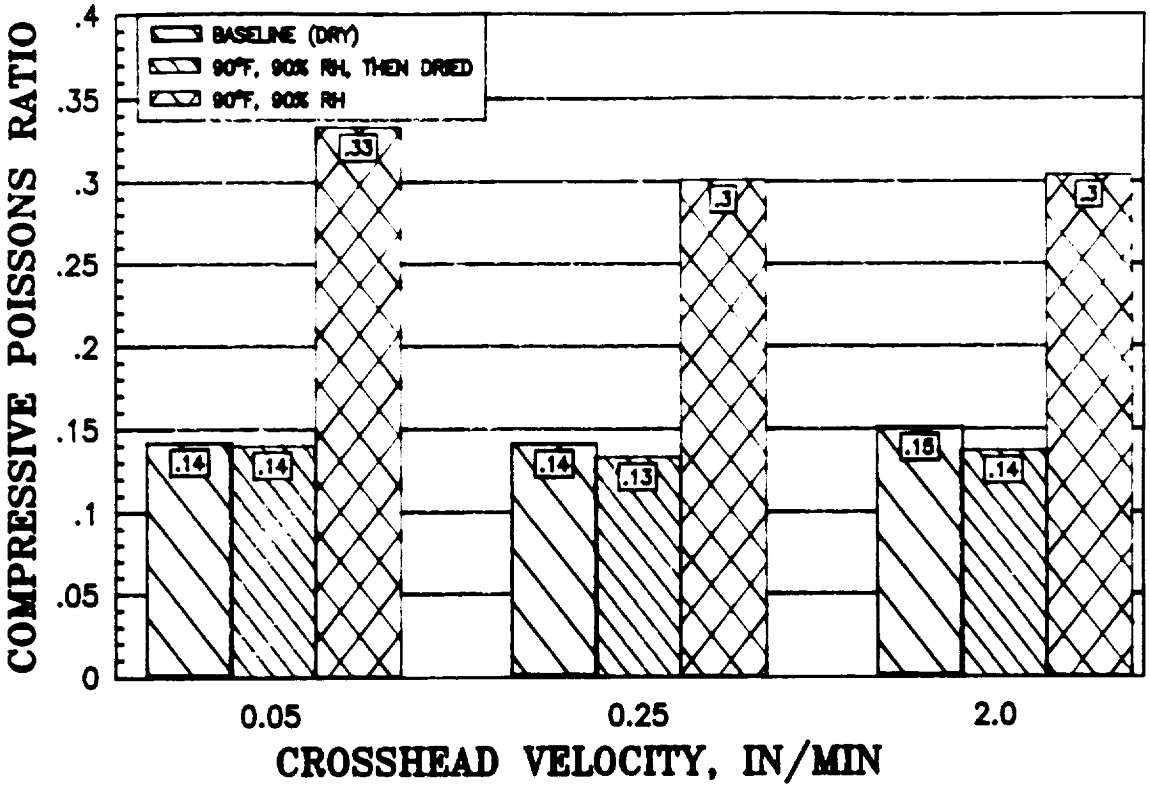
FIGURE 10

SUMMARY OF EFFECT OF HUMIDITY AND LOADING RATE ON TENSILE AND COMPRESSIVE POISSON'S RATIO



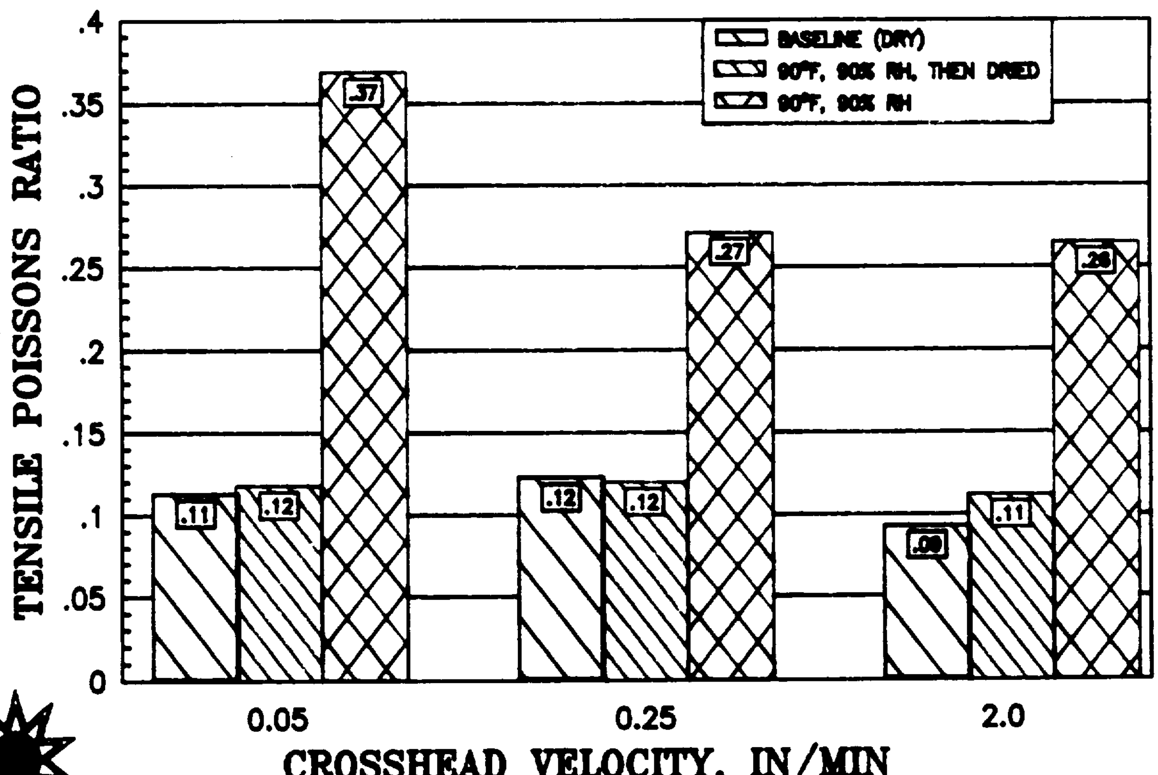


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TABLE 4
SUMMARY OF EFFECT OF HUMIDITY AND LOADING RATE
ON TENSILE DATA, MEAN VALUES

TEST TYPE	AGING CONDITION	TEST TEMP (°F)	CROSSHEAD SPEED (in/min)	STRENGTH MEAN (psi)	MODULUS MEAN (msi)	POISSON'S RATIO
TENSION	BASELINE	75	0.05	314.3	.235	.112
	BASELINE	75	0.25	323.0	.229	.122
	BASELINE	75	2.00	326.2	.228	.0919
	90%RH(DRIED)	75	0.05	382.2	.228	.118
	90%RH(DRIED)	75	0.25	476.2	.282	.120
	90%RH(DRIED)	75	2.00	444.8	.270	.112
	90^{o}F 90%RH	75	0.05	153.7	.0780	.369
	90^{o}F 90%RH	75	0.25	175.6	.0809	.271
	90^{o}F 90%RH	75	2.00	181.0	.0953	.265
	CORRELATION	75	0.05	295.5	-	-

TABLE 5
SUMMARY OF EFFECT OF HUMIDITY AND LOADING RATE
ON COMPRESSIVE DATA, MEAN VALUES

TEST TYPE	AGING CONDITION	TEST TEMP (°F)	CROSSHEAD SPEED (in/min)	STRENGTH MEAN (psi)	MODULUS MEAN (msi)	POISSON'S RATIO
COMPRESSIVE	BASELINE	75	0.05	911	.282	.141
	BASELINE	75	0.25	951	.294	.140
	BASELINE	75	2.00	921	.315	.150
	90%RH(DRIED)	75	0.05	874	.292	.140
	90%RH(DRIED)	75	0.25	1021	.294	.133
	90%RH(DRIED)	75	2.00	1066	.287	.137
	90^{o}F 90%RH	75	0.05	526	.0952	.333
	90^{o}F 90%RH	75	0.25	575	.0956	.301
	90^{o}F 90%RH	75	2.00	619	.0988	.304

TABLE 6
INDIVIDUAL TENSILE PROPERTY SUMMARY
AGED AT 90%RH, 90°F, THEN DRIED AT 180°F

SPECIMEN NO.	AGING CONDITION	TEST TEMP (°F)	CROSSHEAD SPEED (in/min)	STRENGTH (psi)	MODULUS (msi)	POISSON'S RATIO
TEN-75F-90%(DRIED)-0.05-70	90%RH(DRIED)	75	0.05	379.8	.219	.128
TEN-75F-90%(DRIED)-0.05-71	90%RH(DRIED)	75	0.05	348.7	.221	.101
TEN-75F-90%(DRIED)-0.05-73	90%RH(DRIED)	75	0.05	370.4	.217	.118
TEN-75F-90%(DRIED)-0.05-74	90%RH(DRIED)	75	0.05	399.7	.242	.111
TEN-75F-90%(DRIED)-0.05-75	90%RH(DRIED)	75	0.05	310.7	.186	.122
[illegible]-75F-90%(DRIED)-0.05-76	90%RH(DRIED	75	0.05	395.7	.240	.120
TEN-75F-90%(DRIED)-0.05-77	90%RH(DRIED)	75	0.05	403.5	.220	.119
TEN-75F-90%(DRIED)-0.05-109	90%RH(DRIED)	75	0.05	407.5	.251	.119
TEN-75F-90%(DRIED)-0.05-110	90%RH(DRIED)	75	0.05	423.6	.256	.124
			AVE SD CV (%)	382.2 34.8 9.10	.228 .0216 9.47	.118 .00787 6.67

TABLE 7
INDIVIDUAL TENSILE PROPERTY SUMMARY
AGED AT 90%RH, 90°F, THEN DRIED AT 180°F

SPECIMEN NO.	AGING CONDITION	TEST TEMP (°F)	CROSSHEAD SPEED (in/min)	STRENGTH (psi)	MODULUS (msi)	POISSON'S RATIO
TEN-75F-90%(DRIED)-0.25-106	90%RH(DRIED)	75	0.25	471.5	.272	.113
TEN-75F-90%(DRIED)-0.25-107	90%RH(DRIED)	75	0.25	414.2	.282	.120
TEN-75F-90%(DRIED)-0.25-108	90%RH(DRIED)	75	0.25	470.1	.281	.133
TEN-75F-90%(DRIED)-0.25-116	90%RH(DRIED)	75	0.25	549.0	.291	.112
			AVE SD CV (%)	476.2 55.4 11.6	.282 .00777 2.75	.120 .00968 8.06

TABLE 8
INDIVIDUAL TENSILE PROPERTY SUMMARY
AGED AT 90%RH, 90°F, THEN DRIED AT 180°F

SPECIMEN NO.	AGING CONDITION	TEST TEMP (°F)	CROSSHEAD SPEED (in/min)	STRENGTH (psi)	MODULUS (msi)	POISSON'S RATIO
TEN-75F-90%(DRIED)-2.00-111	90%RH(DRIED)	75	2.00	521.4	.263	.112
TEN-75F-90%(DRIED)-2.00-112	90%RH(DRIED)	75	2.00	454.0	.269	.112
TEN-75F-90%(DRIED)-2.00-113	90%RH(DRIED)	75	2.00	397.7	.260	.117
TEN-75F-90%(DRIED)-2.00-114	90%RH(DRIED)	75	2.00	503.6	.267	.100
TEN-75F-90%(DRIED)-2.00-115	90%RH(DRIED)	75	2.00	310.3	.282	.118
TEN-75F-90%(DRIED)-2.00-117	90%RH(DRIED)	75	2.00	481.8	.279	.112
			AVE	444.8	.270	.112
			SD	78.8	.00876	.00640
			CV (%)	17.7	3.24	5.71

TABLE 9
INDIVIDUAL TENSILE PROPERTY SUMMARY
BASELINE SAMPLES (DRY), DWG# EMC-3915

SPECIMEN NO.	AGING CONDITION	TEST TEMP (°F)	CROSSHEAD SPEED (in/min)	STRENGTH (psi)	MODULUS (msi)	POISSON'S RATIO
TEN-75F-DRY-0.05-48	BASELINE	75	0.05	338.4	.240	.104
TEN-75F-DRY-0.05-49	BASELINE	75	0.05	325.1	.245	.106
TEN-75F-DRY-0.05-50	BASELINE	75	0.05	330.0	.240	.100
TEN-75F-DRY-0.05-51	BASELINE	75	0.05	302.8	.264	.114
TEN-75F-DRY-0.05-56	BASELINE	75	0.05	296.6	.218	.100
TEN-75F-DRY-0.05-57	BASELINE	75	0.05	280.5	.231	.115
TEN-75F-DRY-0.05-58	BASELINE	75	0.05	323.6	.223	.123
TEN-75F-DRY-0.05-59	BASELINE	75	0.05	317.7	.222	.137
			AVE SD CV (%)	314.3 19.4 6.17	.235 .0152 6.45	.112 .0128 11.4

TABLE 10
INDIVIDUAL TENSILE PROPERTY SUMMARY
BASELINE SAMPLES DRY

SPECIMEN NO.	AGING CONDITION	TEST TEMP (°F)	CROSSHEAD SPEED (in/min)	STRENGTH (psi)	MODULUS (msi)	POISSON'S RATIO
TEN-75F-DRY-0.25-52	BASELINE	75	0.25	329.8	.250	.108
TEN-75F-DRY-0.25-53	BASELINE	75	0.25	283.4	.238	.129
TEN-75F-DRY-0.25-60	BASELINE	75	0.25	322.2	.188	.113
TEN-75F-DRY-0.25-61	BASELINE	75	0.25	365.9	.211	.150
TEN-75F-DRY-0.25-62	BASELINE	75	0.25	319.0	.255	.128
TEN-75F-DRY-0.25-63	BASELINE	75	0.25	252.0	.234	-
TEN-75F-DRY-0.25-64	BASELINE	75	0.25	403.4	.233	.101
TEN-75F-DRY-0.25-65	BASELINE	75	0.25	314.2	.222	-
			AVE SD CV (%)	323.0 46.4 14.3	.229 .0217 9.47	.122 .0178 14.6

TABLE 11
INDIVIDUAL TENSILE PROPERTY SUMMARY
BASELINE SAMPLES DRY

SPECIMEN NO.	AGING CONDITION	TEST TEMP (^{o}F)	CROSSHEAD SPEED (in/min)	STRENGTH (psi)	MODULUS (msi)	POISSON'S RATIO
TEN-75F-DRY-2.00-54	BASELINE	75	2.0	216.9	.256	.0855
TEN-75F-DRY-2.00-55	BASELINE	75	2.0	349.2	.240	.0900
TEN-75F-DRY-2.00-66	BASELINE	75	2.0	400.2	.214	.107
TEN-75F-DRY-2.00-67	BASELINE	75	2.0	314.5	.207	.103
TEN-75F-DRY-2.00-68	BASELINE	75	2.0	350.0	.222	.0741
			AVE SD CV (%)	326.2 68.3 20.9	.228 .0200 8.77	.0919 .0133 14.5

TABLE 9A - COMPARE TO TABLE 9
INDIVIDUAL TENSILE PROPERTY SUMMARY.
CORRELATION SAMPLES (DRY) TESTED USING OLD GEOMETRY
TO COMPARE THIS PROGRAM WITH PREVIOUS PROGRAM, DWG# EMB-3684.

SPECIMEN NO.	AGING CONDITION	TEST TEMP (^{o}F)	CROSSHEAD SPEED (in/min)	STRENGTH (psi)	MODULUS (msi)	POISSON'S RATIO
TEN-75F-DRY-0.05-1-OLD	CORRELATION	75	0.05	264.8	-	-
TEN-75F-DRY-0.05-2-OLD	CORRELATION	75	0.05	288.5	-	-
TEN-75F-DRY-0.05-3-OLD	CORRELATION	75	0.05	326.4	-	-
TEN-75F-DRY-0.05-4-OLD	CORRELATION	75	0.05	311.4	-	-
TEN-75F-DRY-0.05-5-OLD	CORRELATION	75	0.05	285.8	-	-
TEN-75F-DRY-0.05-6-OLD	CORRELATION	75	0.05	296.1	-	-
			AVE SD CV (%)	295.5 21.4 7.25	- - -	- - -

Previous data obtained on May 1992, P.O# 100206, using specimen geometry of DWG# EMB-3684 also achieved an average tensile strength of 295 psi. Therefore, tensile strength data is reproducible using same geometries at different dates.

TABLE 12
INDIVIDUAL TENSILE PROPERTY SUMMARY
AGED AT 90%RH, 90°F

SPECIMEN NO.	AGING CONDITION	TEST TEMP (°F)	CROSSHEAD SPEED (in/min)	STRENGTH (psi)	MODULUS (msi)	POISSON'S RATIO
TEN-75F-90%-0.05-88	90%RH, 90°F	75	0.05	165.8	.0840	.290
TEN-75F-90%-0.05-89	90%RH, 90°F	75	0.05	124.1	.0786	.383
TEN-75F-90%-0.05-94	90%RH, 90°F	75	0.05	162.8	.0651	.409
TEN-75F-90%-0.05-96	90%RH, 90°F	75	0.05	163.8	.0907	.390
TEN-75F-90%-0.05-98	90%RH, 90°F	75	0.05	151.8	.0718	.373
			AVE SD CV (%)	153.7 17.4 11.3	.0780 .0100 12.8	.369 .0461 12.5

TABLE 13
INDIVIDUAL TENSILE PROPERTY SUMMARY
AGED AT 90%RH, 90°F

SPECIMEN NO.	AGING CONDITION	TEST TEMP (°F)	CROSSHEAD SPEED (in/min)	STRENGTH (psi)	MODULUS (msi)	POISSON'S RATIO
TEN-75F-90%-0.25-90	90%RH, 90°F	75	0.25	158.0	.0678	.264
TEN-75F-90%-0.25-99	90%RH, 90°F	75	0.25	201.6	.0905	.249
TEN-75F-90%-0.25-101	90%RH, 90°F	75	0.25	201.2	.0966	.266
TEN-75F-90%-0.25-102	90%RH, 90°F	75	0.25	141.7	.0687	.306
			AVE SD CV (%)	175.6 30.5 17.4	.0809 .0148 18.3	.271 .0244 8.99

TABLE 14
INDIVIDUAL TENSILE PROPERTY SUMMARY
AGED AT 90%RH, 90°F

SPECIMEN NO.	AGING CONDITION	TEST TEMP (°F)	CROSSHEAD SPEED (in/min)	STRENGTH (psi)	MODULUS (msi)	POISSON'S RATIO
TEN-75F-90%-2.00-92	90%RH, 90°F	75	2.00	188.6	.114	-
TEN-75F-90%-2.00-93	90%RH, 90°F	75	2.00	196.9	.0778	.305
TEN-75F-90%-2.00-100	90%RH, 90°F	75	2.00	160.4	.110	.243
TEN-75F-90%-2.00-103	90%RH, 90°F	75	2.00	203.6	.0842	.263
TEN-75F-90%-2.00-104	90%RH, 90°F	75	2.00	155.7	.0903	.248
			AVE SD CV (%)	181.0 21.7 12.0	.0953 .0160 16.8	.265 .0281 10.6

TABLE 15
INDIVIDUAL COMPRESSIVE PROPERTY SUMMARY
AGED AT 90%RH, 90°F, THEN DRIED AT 180°F

SPECIMEN NO.	AGING CONDITION	TEST TEMP (°F)	CROSSHEAD SPEED (in/min)	STRENGTH (psi)	MODULUS (msi)	POISSON'S RATIO
CMP-75F-90%(DRIED)-0.05-1	90%RH(DRIED)	75	0.05	826	.273	.145
CMP-75F-90%(DRIED)-0.05-2	90%RH(DRIED)	75	0.05	940	.286	.146
CMP-75F-90%(DRIED)-0.05-3	90%RH(DRIED)	75	0.05	882	.337	.142
CMP-75F-90%(DRIED)-0.05-4	90%RH(DRIED)	75	0.05	903	.322	.148
CMP-75F-90%(DRIED)-0.05-5	90%RH(DRIED)	75	0.05	753	.234	.126
CMP-75F-90%(DRIED)-0.05-6	90%RH(DRIED	75	0.05	1011	.284	.128
CMP-75F-90%(DRIED)-0.05-7	90%RH(DRIED)	75	0.05	757	.312	.174
CMP-75F-90%(DRIED)-0.05-8	90%RH(DRIED)	75	0.05	1005	.315	.134
CMP-75F-90%(DRIED)-0.05-9	90%RH(DRIED)	75	0.05	835	.304	.138
CMP-75F-90%(DRIED)-0.05-10	90%RH(DRIED)	75	0.05	824	.252	.114
			AVE SD CV (%)	874 91.8 10.5	.292 .0324 11.1	.140 .0161 11.6

TABLE 16
INDIVIDUAL COMPRESSIVE PROPERTY SUMMARY
AGED AT 90%RH, 90°F, THEN DRIED AT 180°F

SPECIMEN NO.	AGING CONDITION	TEST TEMP (°F)	CROSSHEAD SPEED (in/min)	STRENGTH (psi)	MODULUS (msi)	POISSON'S RATIO
CMP-75F-90%(DRIED)-0.25-11	90%RH(DRIED)	75	0.25	1105	.297	.136
CMP-75F-90%(DRIED)-0.25-12	90%RH(DRIED)	75	0.25	1022	.275	.138
CMP-75F-90%(DRIED)-0.25-13	90%RH(DRIED)	75	0.25	1006	.286	.124
CMP-75F-90%(DRIED)-0.25-14	90%RH(DRIED)	75	0.25	1135	.321	.134
CMP-75F-90%(DRIED)-0.25-15	90%RH(DRIED)	75	0.25	839	.290	.134
			AVE SD CV (%)	1021 116 11.3	.294 .0172 5.84	.133 .00540 4.06

TABLE 17
INDIVIDUAL COMPRESSIVE PROPERTY SUMMARY
AGED AT 90%RH, 90°F, THEN DRIED AT 180°F

SPECIMEN NO.	AGING CONDITION	TEST TEMP (°F)	CROSSHEAD SPEED (in/min)	STRENGTH (psi)	MODULUS (msi)	POISSON'S RATIO
CMP-75F-90%(DRIED)-2.00-16	90%RH(DRIED)	75	2.00	905	.299	.152
CMP-75F-90%(DRIED)-2.00-17	90%RH(DRIED)	75	2.00	1223	.292	.123
CMP-75F-90%(DRIED)-2.00-18	90%RH(DRIED)	75	2.00	1068	.282	.127
CMP-75F-90%(DRIED)-2.00-19	90%RH(DRIED)	75	2.00	953	.302	.175
CMP-75F-90%(DRIED)-2.00-20	90%RH(DRIED)	75	2.00	1182	.262	.107
			AVE SD CV (%)	1066 138 13.0	.287 .0161 5.62	.137 .0268 19.6

TABLE 18
INDIVIDUAL COMPRESSIVE PROPERTY SUMMARY
BASELINE SAMPLES (DRY)

SPECIMEN NO.	AGING CONDITION	TEST TEMP (^{o}F)	CROSSHEAD SPEED (in/min)	STRENGTH (psi)	MODULUS (msi)	POISSON'S RATIO
CMP-75F-DRY-0.05-31	BASELINE	75	0.05	946	.285	.128
CMP-75F-DRY-0.05-32	BASELINE	75	0.05	907	.287	.144
CMP-75F-DRY-0.05-33	BASELINE	75	0.05	875	.281	.133
CMP-75F-DRY-0.05-38	BASELINE	75	0.05	1009	.301	.155
CMP-75F-DRY-0.05-39	BASELINE	75	0.05	968	.288	.166
CMP-75F-DRY-0.05-40	BASELINE	75	0.05	877	.293	.156
CMP-75F-DRY-0.05-41	BASELINE	75	0.05	794	.240	.105
			AVE AD CV (%)	911 71.0 7.79	.282 .0196 6.96	.141 .0208 14.7

TABLE 19
INDIVIDUAL COMPRESSIVE PROPERTY SUMMARY
BASELINE SAMPLES DRY

SPECIMEN NO.	AGING CONDITION	TEST TEMP (^{o}F)	CROSSHEAD SPEED (in/min)	STRENGTH (psi)	MODULUS (msi)	POISSON'S RATIO
CMP-75F-DRY-0.25-34	BASELINE	75	0.25	1071	.279	.115
CMP-75F-DRY-0.25-35	BASELINE	75	0.25	968	.292	--
CMP-75F-DRY-0.25-42	BASELINE	75	0.25	950	.289	.151
CMP-75F-DRY-0.25-43	BASELINE	75	0.25	850	.304	.149
CMP-75F-DRY-0.25-44	BASELINE	75	0.25	916	.306	.145
			AVE SD CV (%)	951 80.8 8.50	.294 .0112 3.80	.140 .0168 12.0

TABLE 20
INDIVIDUAL COMPRESSIVE PROPERTY SUMMARY
BASELINE SAMPLES DRY

SPECIMEN NO.	AGING CONDITION	TEST TEMP (°F)	CROSSHEAD SPEED (in/min)	STRENGTH (psi)	MODULUS (msi)	POISSON'S RATIO
CMP-75F-DRY-2.00-36	BASELINE	75	2.0	889	.308	.137
CMP-75F-DRY-2.00-37	BASELINE	75	2.0	1008	.298	.129
CMP-75F-DRY-2.00-45	BASELINE	75	2.0	846	.337	.177
CMP-75F-DRY-2.00-46	BASELINE	75	2.0	908	.320	.172
CMP-75F-DRY-2.00-47	BASELINE	75	2.0	954	.312	.135
			AVE	921	.315	.150
			SD	62.2	.0146	.0226
			CV (%)	6.75	4.64	15.1

TABLE 21
INDIVIDUAL COMPRESSIVE PROPERTY SUMMARY
AGED AT 90%RH, 90°F

SPECIMEN NO.	AGING CONDITION	TEST TEMP (°F)	CROSSHEAD SPEED (in/min)	STRENGTH (psi)	MODULUS (msi)	POISSON'S RATIO
CMP-75F-90%-0.05-21	90%RH, 90°F	75	0.05	473	0.0839	0.327
CMP-75F-90%-0.05-22	90%RH, 90°F	75	0.05	518	.104	.330
CMP-75F-90%-0.05-23	90%RH, 90°F	75	0.05	553	.0944	.346
CMP-75F-90%-0.05-24	90%RH, 90°F	75	0.05	584	.0992	.322
CMP-75F-90%-0.05-25	90%RH, 90°F	75	0.05	502	.0945	.342
			AVE SD CV (%)	526 43.4 8.26	.0952 .00745 7.83	.333 .0102 3.06

TABLE 22
INDIVIDUAL COMPRESSIVE PROPERTY SUMMARY
AGED AT 90%RH, 90°F

SPECIMEN NO.	AGING CONDITION	TEST TEMP (°F)	CROSSHEAD SPEED (in/min)	STRENGTH (psi)	MODULUS (msi)	POISSON'S RATIO
CMP-75F-90%-0.25-26	90%RH, 90°F	75	0.25	613	.0863	.287
CMP-75F-90%-0.25-27	90%RH, 90°F	75	0.25	589	.0934	.282
CMP-75F-90%-0.25-28	90%RH, 90°F	75	0.25	522	.107	.334
			AVE SD CV (%)	575 47.2 8.20	.0956 .0105 11.0	.301 .0287 9.53

TABLE 23
INDIVIDUAL COMPRESSIVE PROPERTY SUMMARY
AGED AT 90%RH, 90°F

SPECIMEN NO.	AGING CONDITION	TEST TEMP (°F)	CROSSHEAD SPEED (in/min)	STRENGTH (psi)	MODULUS (msi)	POISSON'S RATIO
CMP-75F-90%-2.00-29	90%RH, 90°F	75	2.00	616	.0876	.255
CMP-75F-90%-2.00-30	90%RH, 90°F	75	2.00	622	.110	.352
			AVE SD CV(%)	619 4.24 .685	.0988 .0158 16.0	.304 .0686 22.6

15.0 COEFFICIENT OF THERMAL EXPANSION MEASUREMENTS

Coefficient of Thermal Expansion measurements were made using the quartz push rod dilatometer method (Figure 11) in accordance with Test Specification ASTM E-228 entitled "Linear Thermal Expansion of Solid Materials with a Vitreous Silica Dilatometer".

Sample heating and measurement was performed within the isothermal zone of an insulated furnace, with controlled heating rates that were limited to 5°F per minute. Sample temperature was recorded with a Type K thermocouple, and length changes were recorded with an LVDT displacement transducer.

Two sample sizes were measured for this program; 2.00 inches length by 0.25 inch wide by 0.25 inch thick and; 7.0 inches long with a 0.75 inch diameter.

Each specimen was tested over the range room temperature to 250°F.

Prior to measurement of the PVA/MB samples a calibration test was performed using the NIST fused silica standard reference material, SRM 739-1. The results are shown in Figure 12.

The average CTE results for the PVA/MB samples are shown in Figure 13 and Table 24. Tabulations of the individual values are presented in Tables 25 thru 29.

Tabulations of individual batch formulations, individual cure/aging dates and times, individual dimensional measurements, high humidity wet and dry bulb measurements, strip chart records of cure temperature vs time, plots of the high humidity aging conditions, drying cycle temperature vs time plots, and the individual expansion vs temperature curves are presented in the appendix.

Thermal expansion is presented in percent, and is calculated at each temperature as;

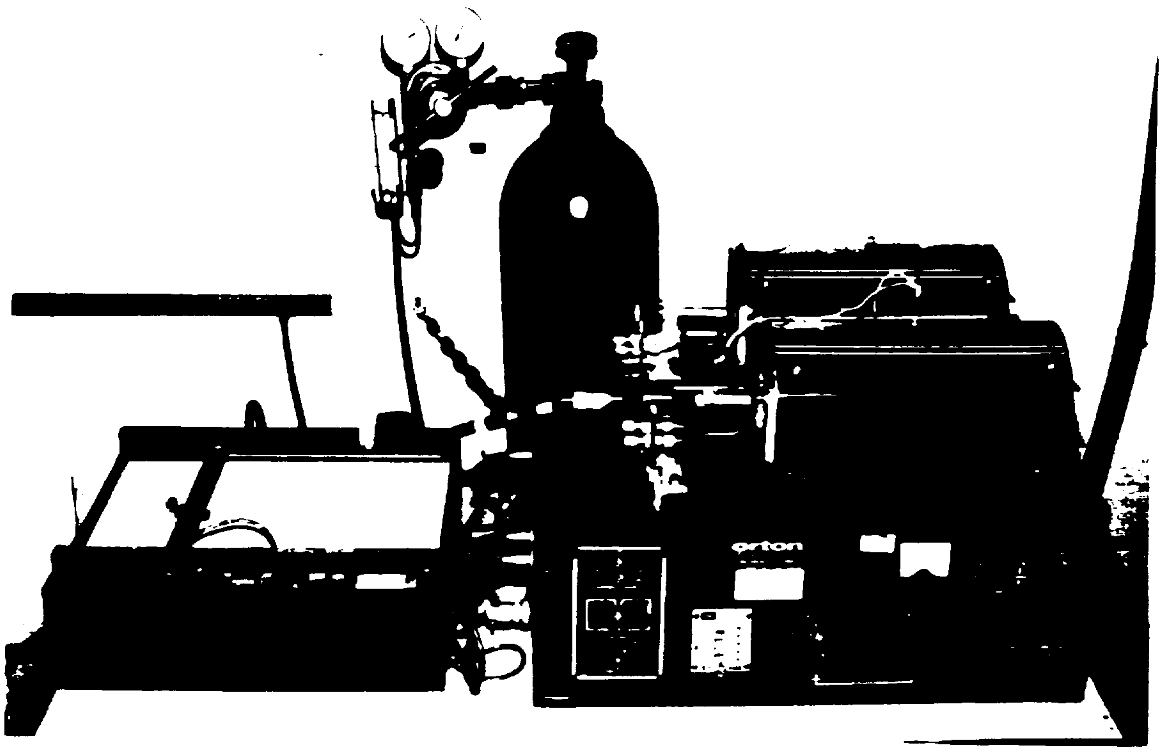
$$\% \text{ Expansion} = \Delta L/L_0 \times 100.$$

where:

ΔL = change in length (in)
L_0 = original length (in)

FIGURE 11

CTE FACILITY



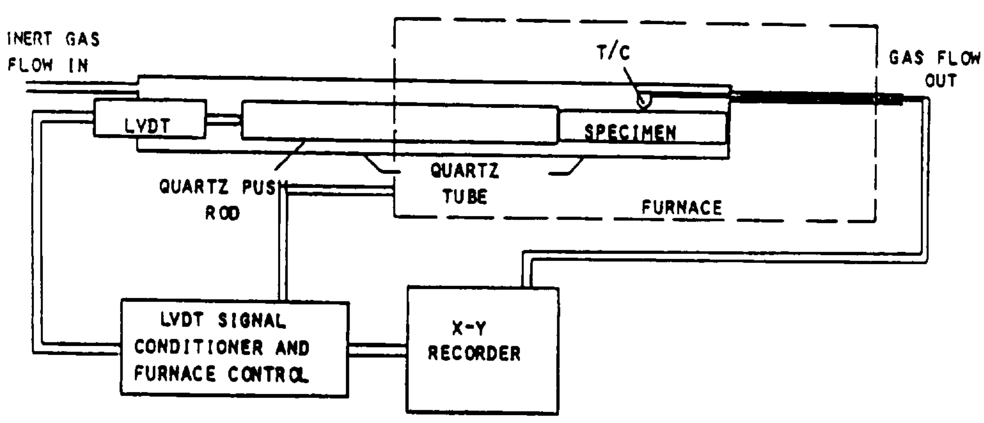
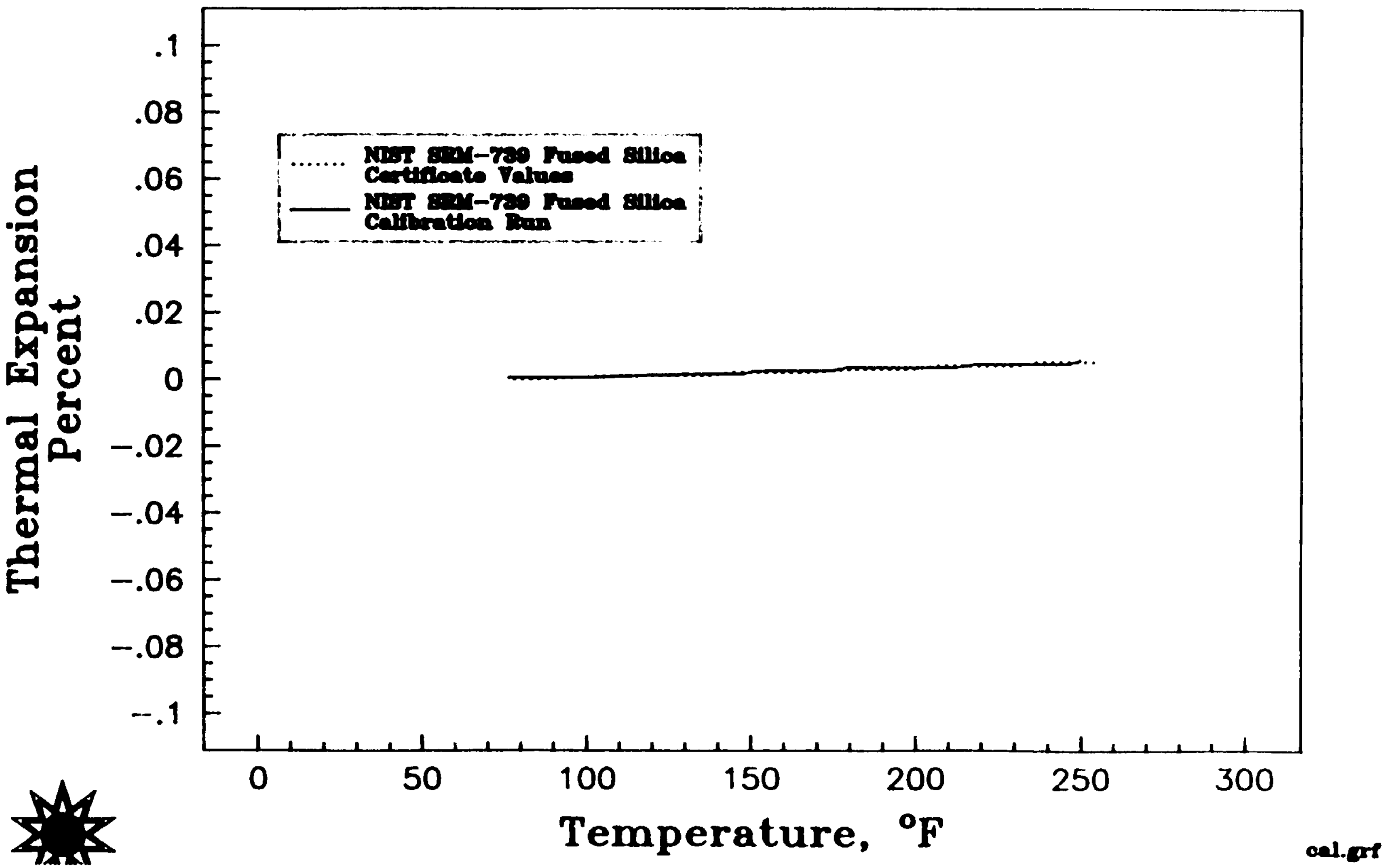


FIGURE 12

PVA/MB SOLUBLE CORE THERMAL EXPANSION TESTING FUSED SILICA (QUARTZ) CALIBRATION

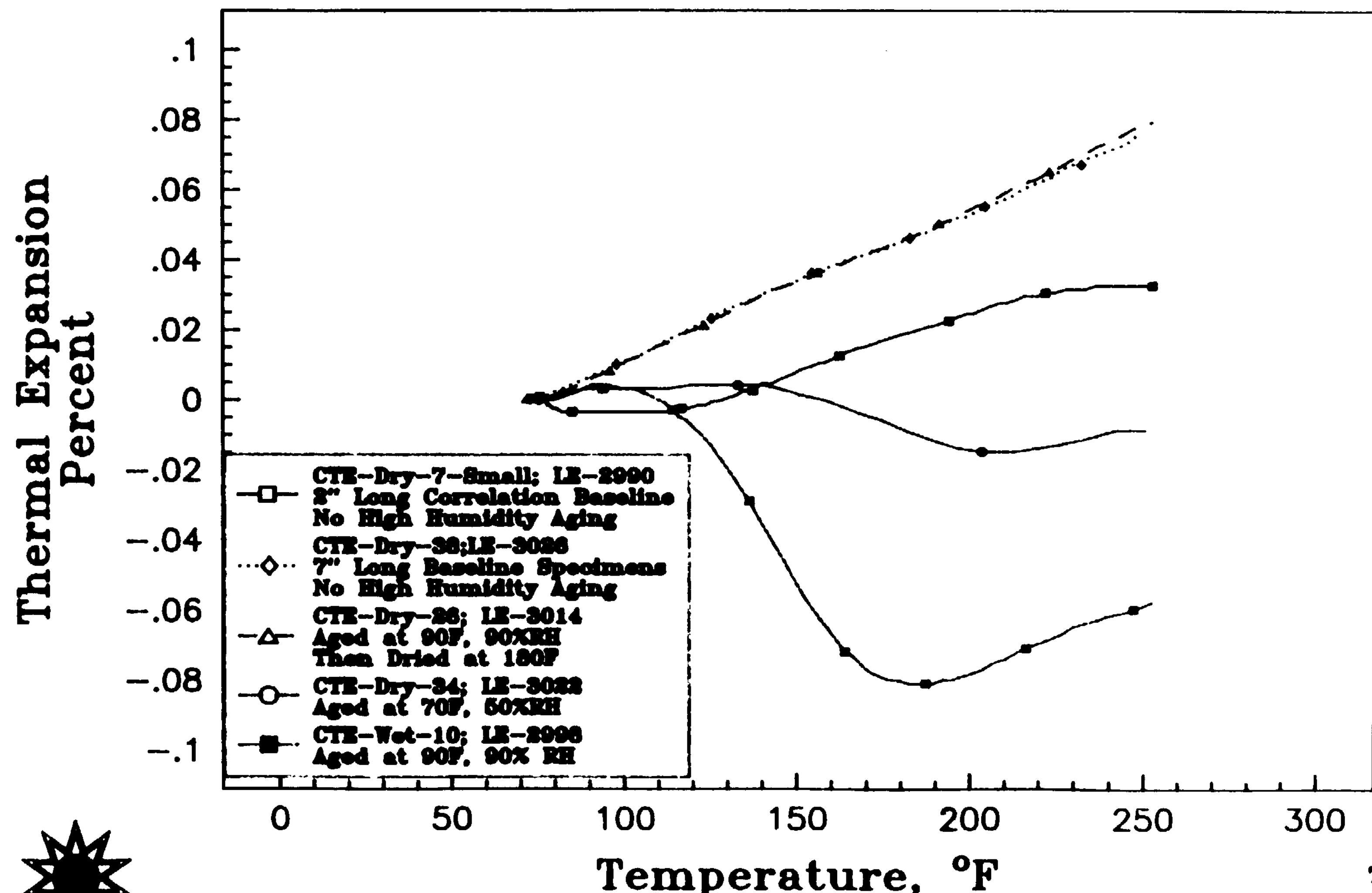


Energy Materials Testing Laboratory

FIGURE 13

SUMMARY OF EFFECT OF HUMIDITY ON THERMAL EXPANSION MEASUREMENTS

PVA/MB SOLUBLE CORE THERMAL EXPANSION TESTING COMPARISON OF TEST CONDITIONS



Energy Materials Testing Laboratory

TestCorr.grf

TABLE 24

SUMMARY OF EFFECT OF HUMIDITY ON CTE DATA

TEST TYPE	AGING CONDITION	CTE (%) AT TEMPERATURE (^{o}F)				
		75	100	140	180	250
CTE	BASELINE	0	.0110	.0299	.0459	.0753
	90%RH(DRIED)	0	.0101	.0284	.0445	.0773
	$70^{o}F$ 50%RH	0	.0048	.0045	-.0093	-.0159
	$90^{o}F$ 90%RH	0	.0039	-.0166	-.0670	-.0700
	CORRELATION	0	-.0049	.0006	.0154	.0393

TABLE 25
INDIVIDUAL THERMAL EXPANSION (CTE) SUMMARY
BASELINE SAMPLES (DRY)

SPECIMEN NO.	AGING CONDITION	CTE (%) AT TEMPERATURE (°F)				
		75	100	140	180	250
CTE-DRY-36	BASELINE	0	.014	.033	.050	.086
37	"	0	.011	.029	.045	.076
38	"	0	.011	.030	.045	.075
39	"	0	.010	.028	.044	.077
40	"	0	.011	.030	.046	.077
41	"	0	.011	.030	.045	.068
42	"	0	.010	.029	.046	.071
43	"	0	.010	.030	.046	.072
AVE SD CV (%)			.0110 .001309 11.90	.0299 .001458 4.88	.0459 .001808 3.94	.0753 .005392 7.16

TABLE 26
INDIVIDUAL THERMAL EXPANSION (CTE) SUMMARY
AGED AT 90°F 90% RH

SPECIMEN NO.	AGING CONDITION	CTE (%) AT TEMPERATURE (°F)				
		75	100	140	180	250
CTE-90%-9	90°F 90%RH	0	-.005	-.044	-.091	-.068
10	"	0	.003	-.036	-.080	-.059
11	"	0	-.001	-.043	-.063	-.045
12	"	0	.009	.003	-.050	-.062
13	"	0	.013	.003	-.063	-.083
14	"	0	.003	-.002	-.064	-.085
15	"	0	.005	.003	-.058	-.088
AVE SD CV (%)			.0039 .005984 153.44	-.0166 .023057 138.90	-.0670 .013880 20.72	-.0700 .0160 22.83

Note: CV(%) value is not relevant in this type of analysis but is presented for reference. As the thermal expansion curve returns to zero percent expansion, CV(%) approaches infinity. A better indication of the data spread is reflected in the SD values.

TABLE 27
INDIVIDUAL THERMAL EXPANSION (CTE) SUMMARY
AGED AT 90°F 90% RH THEN DRIED AT 180°F

SPECIMEN NO.	AGING CONDITION	CTE (%) AT TEMPERATURE (°F)				
		75	100	140	180	250
CTE-90%(DRIED)-20	90%RH (DRIED)	0	.009	.024	.038	.066
21	"	0	.011	.028	.043	.074
22	"	0	.010	.029	.047	.082
23	"	0	.010	.028	.043	.078
24	"	0	.010	.031	.049	.083
25	"	0	.009	.029	.048	.082
26	"	0	.011	.029	.045	.078
27	"	0	.011	.029	.043	.075
AVE SD CV (%)			.0101 .000835 8.26	.0284 .001996 7.03	.0445 .003546 7.97	.0773 .005625 7.28

TABLE 28
INDIVIDUAL THERMAL EXPANSION (CTE) SUMMARY
AGED AT 70°F 50% RH

SPECIMEN NO.	AGING CONDITION	CTE (%) AT TEMPERATURE (°F)				
		75	100	140	180	250
CTE-50%-28	70°F 50%RH	0	.004	.004	-.012	-.024
29	"	0	.006	.007	-.003	-.006
30	"	0	.005	.002	-.017	-.033
31	"	0	.007	.008	-.007	-.019
32	"	0	.004	.004	-.009	-.012
33	"	0	.004	.003	-.011	-.010
34	"	0	.003	.003	-.009	-.009
35	"	0	.005	.005	-.006	-.014
AVE SD CV (%)			.0048 .001282 26.70	.0045 .002070 46.00	-.0093 .004234 45.53	-.0159 .008999 56.60

Note: CV(%) value is not relevant in this type of analysis but is presented for reference. As the thermal expansion curve returns to zero percent expansion, CV(%) approaches infinity. A better indication of the data spread is reflected in the SD values.

TABLE 29 COMPARE WITH TABLE 25
INDIVIDUAL THERMAL EXPANSION (CTE) SUMMARY
CORRELATION SAMPLES (0.25" BY 0.25" BY 2.0" LONG)
TESTED DRY FOR COMPARISON TO LARGER SPECIMEN SIZE

SPECIMEN NO.	AGING CONDITION	CTE (%) AT TEMPERATURE (°F)				
		75	100	140	180	250
CTE-Dry-1-Small	CORRELATION	0	-.001	.002	.018	.048
2	"	0	-.003	.005	.025	.056
3	"	0	-.001	.006	.021	.053
4	"	0	-.004	-.003	.013	.049
5	"	0	-.007	.002	.010	.023
6	"	0	-.012	-.011	-.002	.012
7	"	0	-.005	.003	.018	.032
8	"	0	-.006	.001	.020	.041
AVE SD CV (%)			-.0049 .003603 73.53	.0006 .005423 903.86	.0154 .008417 54.65	.0393 .015600 39.69

Note: CV(%) value is not relevant in this type of analysis but is presented for reference. As the thermal expansion curve returns to zero percent expansion, CV(%) approaches infinity. A better indication of the data spread is reflected in the SD values.

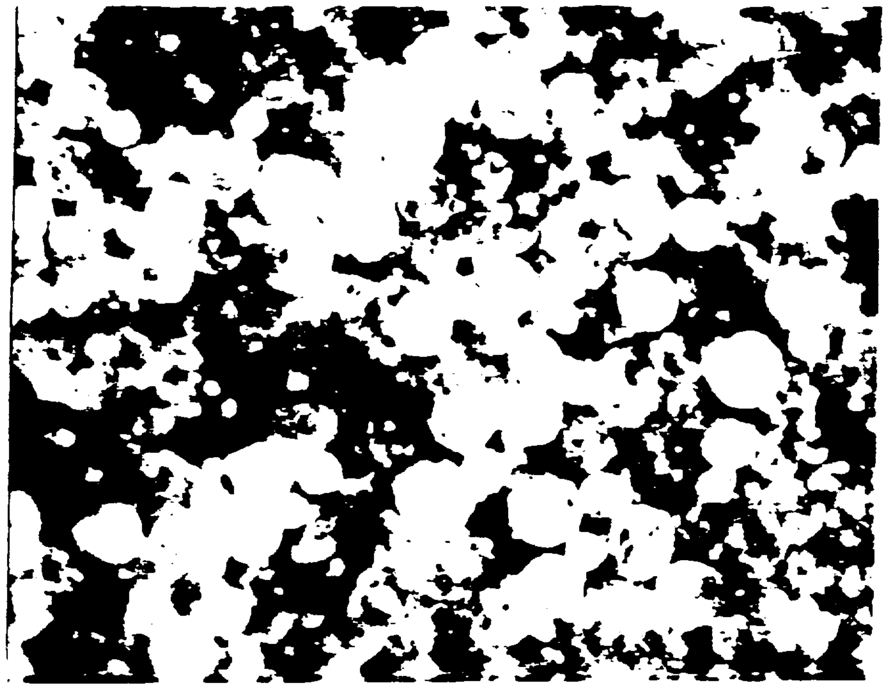
16.0 MICROSCOPIC EXAMINATION OF FRACTURE SURFACES

Outer and inner surfaces of several specimens were microscopically examined to verify that the microballons were not crushed during the molding operation. No evidence of crushed microballons was observed on these surfaces. The machined surfaces of the specimens were also examined, and as expected, the grinding operation opened microballons on these surfaces. The fracture surface of the specimens were also examined, and as expected, these surfaces also contain open microballons. Photomicrographs were also taken of the specimens subjected to high humidity conditions to determine if these samples appeared to be anomalous. All photomicrographed samples showed no anomalies. Reference Figure 14 for a representative sample of these photomicrographs.

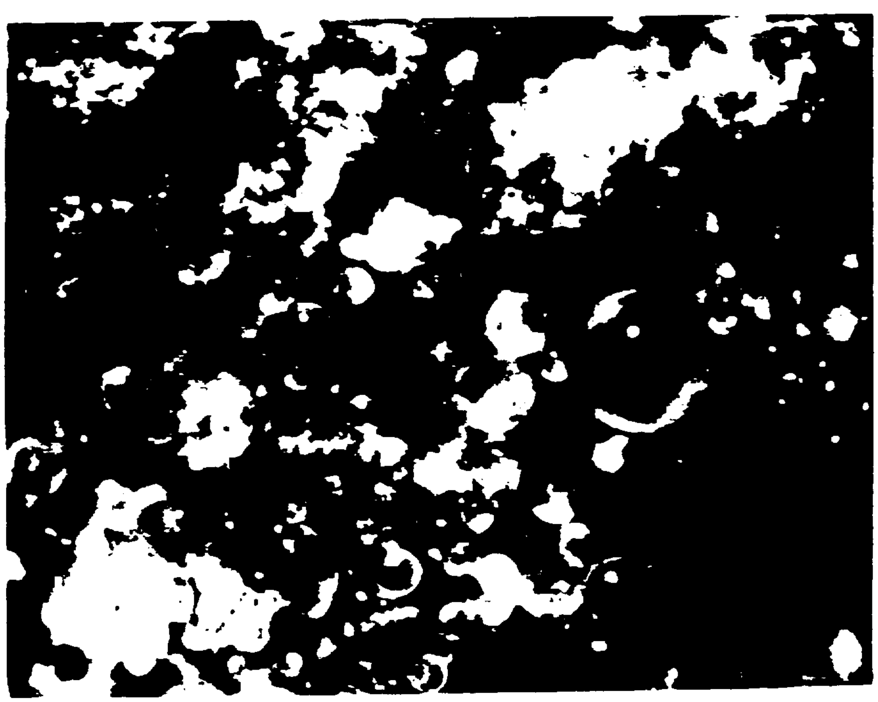
This examination was conducted using an Olympus SZ40 stereomicroscope.

Figure 15 is a photograph of typical tensile and compressive failure modes.

FIGURE 14
PHOTOGRAPHS OF FRACTURE SURFACES
MAGNIFICATION = 55X



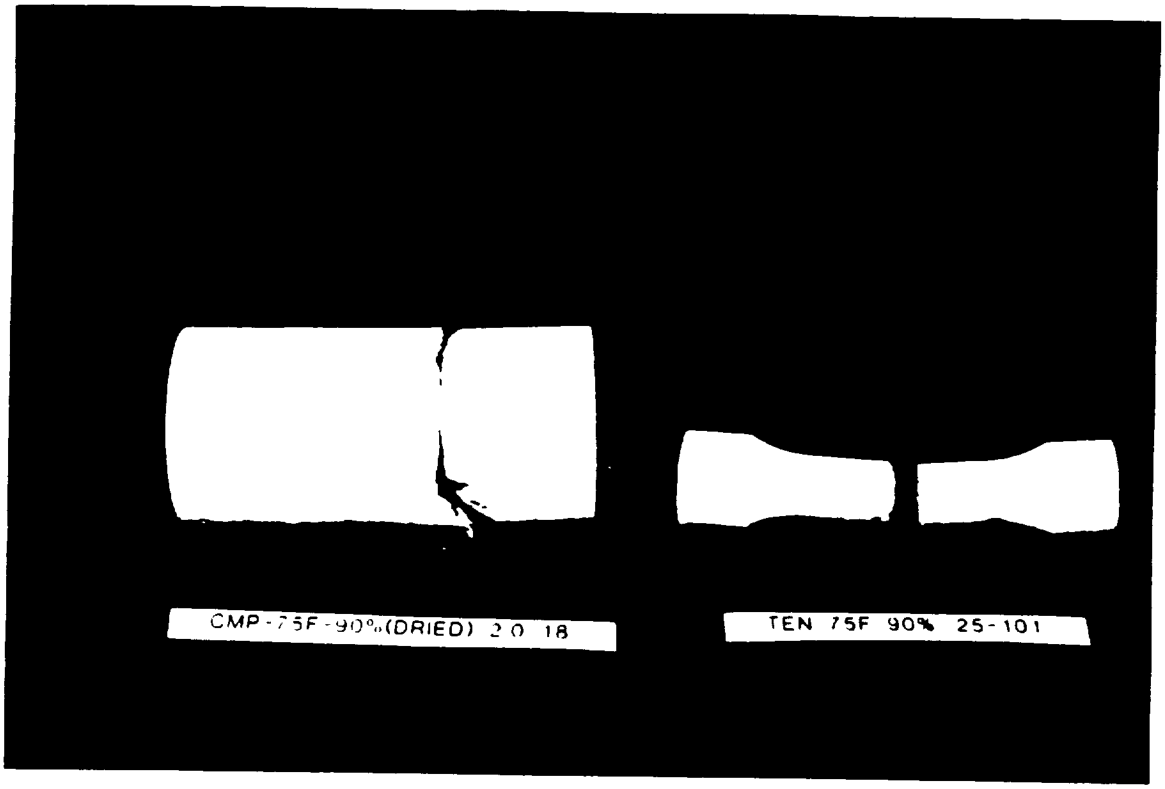
AS MOLDED SURFACE: TEN-75F-90%(DRIED)-0.05-77



FRACTURE SURFACE: TEN-75F-90%(DRIED)-0.05-77

FIGURE 15

TYPICAL TENSILE AND COMPRESSION SPECIMEN FAILURE MODES



17.0 DISCUSSION/ OBSERVATIONS

Effect of Humidity and Loading Rate on Tensile and Compressive Properties.

The primary objective of this work was to determine if cured soluble core filler material regains its tensile and compressive strength after redrying following exposure to high humidity conditions.

The pass/fail criteria was that the material's tensile and compressive ultimate strength shall return to within one standard deviation of the baseline ultimate strength after exposure to high humidity conditions followed by a drying cycle.

Figure 8 in section 14.0, shows that not only does the material regain its tensile and compressive strength after high humidity conditioning and redrying, but the conditioning cycle actually increases the tensile and compressive strength. Similar responses were noted for modulus and Poisson's ratio.

One possible explanation for this is that the high humidity conditioning further distributes the binder (PVA) around the microballons providing additional bonding sites and, therefore, greater dry sample strength.

If this is true, then it follows that storing a pre-cured mixture in a sealed container for a week, more or less, may improve the distribution of binder (PVA) around the microballons and provide stronger samples.

It may also be true that an increase in the amount of binder (PVA) in a mixture will increase the strength of the samples.

The effect of mixture pre-cure storage time and PVA concentration could be determined by testing samples where (1) The mixture pre-cure storage time is varied and (2) The PVA concentration is varied.

Figure 8 also shows that the samples conditioned at 90°F,90%RH had lower tensile and compressive strengths than the dry samples and that the high humidity condition is the primary factor responsible for the large reductions in tensile and compressive strength. Significant changes in modulus and Poisson's ratio were also noted for increases in humidity level.

Also evident was increases in loading rate, increased the ultimate tensile and compressive strength. The impact of loading rate on modulus and Poisson's ratio was minimal.

Filling and Packing of the Tensile and Compression Molds.

The method used to prepare uniformly compacted compression specimens was to add the loose PVA/MB mix to the mold in approximately 200 ml portions. Each portion was tamped and compacted before the next was added. This process was continued until the mold was completely filled.

Tensile samples were more difficult pack uniformly than the compression samples because of the smaller diameter of the tensile samples. We discovered that adding and packing the loose material in ≈25 ml portions, resulted in uniformly compacted tensile samples. We also realized that using a mold geometry that allowed us to pack the material from one side, rather than from the top to bottom, would have made it easier to create uniformly compacted tensile samples.

Great care was taken to obtain tightly packed samples of uniform density since we knew from previous work, with this PVA/MB material, that the degree and uniformity of compaction has a direct effect on the strength of the material. The difficulty we encountered in creating uniform compacted laboratory tensile samples underscores the difficulty we expected will be encountered when large solid rocket motor molds are created with the PVA/MB material.

It is our belief that the tensile and compressive properties, of the PVA/MB material, is highly dependent upon the packing uniformity and localized density of the material.

Some sort of automated packing system, which would insure maximum compaction, would provide maximum strength properties and lower the coefficient of variance in the data.

Tensile and Compression Failure Modes.

All of the tensile specimens, aged at various conditions and tested at various loading rates, failed in the expected reduced cross-sectional area of the specimen. The compression samples failed in what can be described as either a "cone and split" or "simple flat crushing" sample failure mode. Reference Figure 15 for a photograph of typical tensile and compression specimen failures.

Thermal Expansion

Moisture level has a significant influence on the free thermal expansion response of the material. Figure 13, in section 15, shows acomparison of the effect of humidity level on thermal expansion measurements.

Samples tested directly out of the cureoven and cooled in a desiccated chamber, prior to testing, (baseline dry) expanded in a linear manner.

Samples tested after conditioning at 90°F, 90%RH, then redried at 180°F, and cooled in a desiccated chamber, expanded in a linear manner like the baseline dry samples.

Samples tested after conditioning at 90°F, 90%RH, contracted considerably before expanding. These samples were saturated with water, during the high humidity conditioning, causing the sample to swell. Therefore, during testing, as the water was out of the sample, the sample contracted. Once all of the water was gone, the sample expanded as expected.

Samples conditioned at 70°F, 50%RH, under laboratory ambient conditions, contracted like the high humidity samples but not to the same magnitude, before expanding. These samples absorbed some moisture, during the 7 day period in the lab, causing the sample to swell. Therefore, during testing, as the water was driven out of the sample, the sample contracted. Once all of the water was gone, the sample expanded as expected.

The 2" long baseline dry correlation samples were anomalous. These samples should have responded like the other baseline dry samples. However, they behaved more like the 7" long samples conditioned at 70°F, 50%RH. The smaller sample size must be the cause. The small sample is more likely to contain proportionally larger localized variations in density than the larger sample, resulting in a greater effect on the CTE measurement. Another possible reason for the discrepancy could be the contact force of the LVDT. Although these are called "Free" thermal expansion tests, there is a small force of ≈25 grams acting axially against the specimen. This small load may be sufficient to effect the CTE measurement on 2" long, 1/4" by 1/4" square cross-section samples. The cross-sectional area difference between the 2" long (1/4" by 1/4" square) samples and the 7" long (0.75" dia) samples is a factor of 7 times.

Current Program Compared to Previous Work

If one was to compare test results from the previous work (EMTL Report # 1430) to the results from this program one would see that the slightly higher humidity level of (95°F, 95%R@) vs (90°F, 90%RH) caused a further reduction in tensile and compressive strength. However, itshould be noted that the tensile sample geometries were different for the two programs and that the geometry differefce could account for some of the strength difference. Also note that the previous programs dry samples were stored under laboratory ambient conditions (70°F, 50%RH) and not in a desiccator.

General Observations

It was observed during the packing of the samples that the moist mixture turns into a dry crust very rapidly (< 5min) once exposed to air.

For future reference, the specified cooldown period of6 hours before testing seems excessive. The small laboratory sized samples, used in this program, cooled to room temperature within 30 minutes or less.

REFERENCES

[1] AEROJET ASRM, "Process Development Test Plan", WBS No. 1.4.3.4, DR-TM05, Type 3, page 1.

APPENDIX

MICROBALLON CERTIFICATE OF ANALYSIS

The PQ Corporation

P.O. Box 2
Chattanooga, Tennessee 37
Telephone: 615 629-7
TELEX: 558
Cable: PAPAPP
FAX: 615 698-0

CERTIFICATE OF ANALYSIS

CUSTOMER: Fiber Materials Inc.

DATE: October 26, 1992
P.O. #: 72010
PRODUCT CODE: SG

PRODUCT: SG
LOT NUMBER: Z1

Test Method	Discription	Results
U.S. STANDARD SIEVE	PARTICLE SIZE DISTRIBUTION:	10 - 425 MICRONS
WT % OVER SIEVE	MEAN PARTICLE DIAMETER:	140 MICRONS
VISUAL	APPEARANCE:	GRAY, FREE FLOWING
N/A	MELTING POINT:	>2700 DEGREES F
WEIGHT PER MEASURED VOLUME	BULK DENSITY:	24.1 LBS/FT3
AIR PYCNOMETER	SPECIFIC GRAVITY:	0.687 G/CC
% LOSS OVEN DRIED SAMPLE	MOISTURE:	0.2 %

SIGNED Thomas Burns

Thomas Burns
QUALITY CONTROL TECHNICIAN

*********** PACKING LIST ***********

SHIPPER: THE PQ CORPORATION
601 CUMBERLAND BLDG. 29
CHATTANOOGA, TN 37404

SHIP TO: Fiber Materials Inc.
5 Morin St/Biddeford Ind Pk
Biddeford, ME 04005

CUSTOMER P.O. NO: 72010 SHIP VIA: UPS

ORDERED	SHIPPED	DESCRIPTION
2/50# bags)	SAME	Extendospheres SG

HIP DATE: 26 Oct 92

ECEIVED BY:

INDIVIDUAL BATCH FORMULATION DATA

FORMULATION OF SOLUBLE CORE MIXTURE

BATCH #	MB (g)	H_2O (g)	ETHANOL (g)	PVA (g)	TOTAL (g)	BINDER TEMP (F)	BINDER MIX TIME (min)	FILLER MIXING TIME (min)
1	1874.9	250.3	251.2	125.5	-	135.5	60	5
2	1873.0	250.5	251.9	125.1	2428.9	138.2	45	5
3	1877.0	253.3	254.5	126.4	2457.9	131.0	45	5
4	1879.7	253.8	255.0	126.0	2453.7	131.9	70	5
5	1875.0	253.8	252.7	127.4	2448.2	136.4	60	5
6	1876.2	254.4	254.6	128.1	-	132.8	70	5
7	1879.3	254.1	252.4	129.3	2443.6	136.4	60	5
8	1878.2	254.2	255.0	126.6	2457.4	137.3	45	5
9	1875.5	251.2	253.9	127.0	2439.5	136.4	60	5
10	1879.7	252.7	252.8	128.7	2458.3	134.6	60	5
11	1875.9	251.7	254.1	127.3	2610.1	131.0	60	5
12	1876.6	253.3	255.9	127.7	-	134.6	75	5
13	1877.7	255.1	253.2	128.9	2469.4	136.0	60	5
14	1879.1	253.6	253.6	126.1	2460.7	136.5	60	5
15	1875.6	252.2	254.2	129.6	2452.7	138.2	45	5
16	1878.1	245.5	253.3	129.7	2458.1	138.6	60	5
17	1874.3	251.8	253.3	128.7	2453.6	140.0	60	5

Note: Following statements apply for all batches.

Binder mix agitation speed: Stirred binder slowly with magnetic stirrer hot plate.
PVA addtion rate: Slowly added PVA to microballons by hand while stirring.
Filler mixing speed: Slow mixed by hand.
Mixed filler storage time: For all compressions, there was no storage time. All compression batches were completely used or remainder discarded. For tensiles, storage time was less than 2 weeks.

JAB mixed all batches.
GMV packed all compressions.
JAB packed tension #1 thru #45. Not used.
GMV packed tension #46 thru #117
GMV packed all CTEs

INDIVIDUAL CURING/AGING DATE AND TIME SUMMARIES

AEROJET ASRM PVA/MB
INDIVIDUAL CURING/AGING DATE AND TIME INFORMATION

SPECIMEN NO.	BATCH #	CURE START	CURE FINISH	HUMIDITY START	HUMIDITY FINISH	DRYING START	DRYING FINISH	COOL START	COOL FINISH	TEST	TECH
CMP-75F-90%(DRIED)-0.05-1	1	11/05/92 11:00	11/06/92 07:50	11/6/92 14:00	11/11/92 16:00	11/11/92 16:00	11/12/92 08:00	11/12/92 08:"00	11/12/92 15:05	15:25	JPF
2	"	"	"	"	"	"	"	"	11/12/92 15:35	15:51	JPF
3	"	"	"	"	"	"	"	"	11/12/92 15:59	16:04	JPF
4	"	"	"	"	"	"	"	"	11/12/92 16:05	16:16	JPF
5	"	"	"	"	"	"	"	"	11/12/92 16:17	16:28	JPF
6	2	"	"	"	"	"	"	"	11/12/92 16:30	16:41	JPF
7	"	"	"	"	"	"	"	"	11/12/92 16:42	16:49	JPF
8	"	"	"	"	"	"	"	"	11/12/92 16:50	17:00	JPF
9	"	"	"	"	"	"	"	"	11/13/92 08:50	09:03	JPF
10	"	"	"	"	"	"	"	"	11/13/92 09:05	09:14	JPF
CMP-75F-90%(DRIED)-.25-11	3	11/06/92 09:35	11/09/92 07:45	11/11/92 16:00	11/16/92 16:00	11/16/92 16:00	11/17/92 08:00	11/17/92 08:00	11/17/92 14:11	14:20	JPF
12	"	"	"	"	"	"	"	"	11/17/92 14:34	14:36	JPF
13	"	"	"	"	"	"	"	"	11/17/92 14:49	14:52	JPF
14	"	"	"	"	"	"	"	"	11/17/92 15:15	15:19	JPF
15	"	"	"	"	"	"	"	"	11/17/92 15:26	15:30	JPF
CMP-75F-90%(DRIED)-2.0-16	4	"	"	"	"	"	"	"	11/17/92 15:45	15:49	JPF
17	"	"	"	"	"	"	"	"	11/18/92 09:15	09:23	JPF
18	"	"	"	"	"	"	"	"	11/18/92 10:16	10:23	JPF
19	"	"	"	"	"	"	"	"	11/18/92 10:25	10:34	JPF
20	"	"	"	"	"	"	"	"	11/18/92 10:36	10:41	JPF

NOTE: Reference appendix for strip chart of Temperature vs Time cure profile, Humidity and Temperature vs Time aging plots, for specimens.

AEROJET ASRM PVA/MB
INDIVIDUAL CURING/AGING DATE AND TIME INFORMATION

SPECIMEN NO.	BATCH #	CURE START	CURE FINISH	HUMIDITY START	HUMIDITY FINISH	DRYING START	DRYING FINISH	COOL START	COOL FINISH	TEST	TECH
CMP-75F-90%-0.05-21	5	11/9/92 09:30	11/10/92 07:45	11/12/92 08:00	11/17/92 09:36	-	-	-	-	09:41	JPF
22	"	"	"	"	11/17/92 09:45	-	-	-	-	09:56	JPF
23	"	"	"	"	11/17/92 09:56	-	-	-	-	10:08	JPF
24	"	"	"	"	11/17/92 10:25	-	-	-	-	10:41	JPF
25	"	"	"	"	11/17/92 10:38	-	-	-	-	10:51	JPF
CMP-75F-90%-0.25-26	6	"	"	"	11/17/92 10:51	-	-	-	-	11:05	JPF
27	"	"	"	"	11/17/92 11:05	-	-	-	-	11:14	JPF
28	"	"	"	"	11/17/92 11:11	-	-	-	-	11:18	JPF
CMP-75F-90%-2.0- 29	"	"	"	"	11/17/92 11:22	-	-	-	-	11:29	JPF
30	"	"	"	"	11/17/92 11:35	-	-	-	-	11:39	JPF
CMP-75F-DRY-.05-31	7	11/12/92 09:15	11/13/92 07:45	-	-	11/13/92 12:00	11/13/92 16:00	11/13/92 16:00	11/16/92 09:05	09:11	JPF
32	"	"	"	-	-	"	"	"	11/16/92 09:15	09:20	JPF
33	8	"	"	-	-	"	"	"	11/16/92 09:22	09:28	JPF
CMP-75F-DRY-0.25- 34	"	"	"	-	-	"	"	"	11/16/92 09:47	10:03	JPF
35	"	"	"	-	-	"	"	"	11/16/92 10:03	10:13	JPF
CMP-75F-DRY-2.0- 36	"	"	"	-	-	"	"	"	11/16/92 10:24	10:55	JPF
37	"	"	"	-	-	"	"	"	11/16/92 11:00	11:09	JPF

NOTE: Reference appendix for strip chart of Temperature vs Time cure profile, Humidity and Temperature vs Time aging plots, for specimens.

AEROJET ASRM PVA/MB
INDIVIDUAL CURING/AGING DATE AND TIME INFORMATION

SPECIMEN NO.	BATCH #	CURE START	CURE FINISH	HUMIDITY START	HUMIDITY FINISH	DRYING START	DRYING FINISH	COOL START	COOL FINISH	TEST	TECH
CMP-75-DRY-.05 - 38	11	11-30-92 09:30	12-01-92 07:45	-	-	12-01-92 12:45	12-01-92 13:25	12-01-92 13:25	12-01-92 13:25	12-01-92 13:29	JPF
39	"	"	"	-	-	"	"	"	12-01-92 13:38	13:38	JPF
40	"	"	"	-	-	"	"	"	12-01-92 13:50	13:50	JPF
41	"	"	"	-	-	"	"	"	12-01-92 13:59	13:59	JPF
CMP-75F-DRY-0.25-42	11/12	"	"	-	-	"	"	"	12-01-92 14:09	14:09	JPF
43	"	"	"	-	-	"	"	"	12-01-92 14:15	14:16	JPF
44	12	"	"	-	-	"	"	"	12-01-92 14:20	14:22	JPF
CMP-75F-DRY-2.0- 45	"	"	"	-	-	"	"	"	12-01-92 14:25	14:29	JPF
46	"	"	"	-	-	"	"	"	12-01-92 14:35	14:36	JPF
47	"	"	"	-	-	"	"	"	12-01-92 14:40	14:43	JPF

NOTE: Reference appendix for strip chart of Temperature vs Time cure profile, Humidity and Temperature vs Time aging plots, for specimens.

AEROJET ASRM PVA/MB
INDIVIDUAL CURING/AGING DATE AND TIME INFORMATION

SPECIMEN NO.	BATCH #	CURE START	CURE FINISH	HUMIDITY START	HUMIDITY FINISH	DRYING START	DRYING FINISH	COOL START	COOL FINISH	TEST TIME	TECH
TEN-75F-DRY-.05- 48	10	11-30-92 08:30	12-01-92 07:45	--	--	--	--	12-01-92 07:45	12-01-92 09:20	09:27	JPF
49	"	"	"	--	--	--	--	"	12-01-92 09:30	09:42	JPF
50	"	"	"	--	--	--	--	"	12-01-92 09:53	09:55	JPF
51	"	"	"	--	--	--	--	"	12-01-92 10:15	10:28	JPF
TEN-75F-DRY-0.25-52	"	11-30-92 16:15	"	--	--	--	--	"	12-01-92 10:38	10.42	JPF
53	"	"	"	--	--	--	--	"	12-01-92 10:50	10:51	JPF
TEN-75F-DRY-2.0-54	"	"	"	--	--	--	--	"	12-01-92 11:00	11:05	JPF
55	"	"	"	--	--	--	--	"	12-01-92 11:16	11:23	JPF

NOTE: Reference appendix for strip chart of Temperature vs Time cure profile, Humidity and Temperature vs Time aging plots, for specimens.

AEROJET ASRM PVA/MB
INDIVIDUAL CURING/AGING DATE AND TIME INFORMATION

SPECIMEN NO.	BATCH #	CURE START	CURE FINISH	HUMIDITY START	HUMIDITY FINISH	DRYING START	DRYING FINISH	COOL START	COOL FINISH	TEST TIME	TECH
TEN-75F-DRY-0.05-56	13	12-01-92 15:30	12-02-92 07:45	--	--	--	--	12-02-92 07:45	12-02-92 14:10	12-02-92 14:26	JPF
57	"	"	"	--	--	--	--	"	14:35	14:42	JPF
58	"	"	"	--	--	--	--	"	14:53	15:19	JPF
59	"	"	"	--	--	--	--	"	15:25	15:33	JPF
TEN-75F-DRY-0.25-60	"	12-02-92 16:00	12-03-92 07:45	--	--	--	--	12-03-92 07:45	12-03-92 08:45	12-03-92 08:52	GMV
61	"	"	"	--	--	--	--	"	12-03-92 09:00	12-03-92 09:03	JPF
62	"	12-03-92 10:45	12-04-92 07:45	--	--	--	--	12-04-92 07:45	12-04-92 08:20	12-04-92 08:27	JPF
63	"	"	"	--	--	--	--	"	08:35	08:23	JPF
64	"	"	"	--	--	--	--	"	08:45	08:47	JPF
65	"	"	"	--	--	--	--	"	08:56	08:58	JPF
TEN-75F-DRY-2.0-66	"	12-03-92 16:30	"	--	--	--	--	"	09:10	09:14	JPF
67	"	"	"	--	--	--	--	"	09:20	09:26	JPF
68	"	"	"	--	--	--	--	"	09:30	09:36	JPF
TEN-75F-90%(DRIED)-.05-70	"	12-07-92 08:10	12-08-92 08:00	12-9-92 16:00	12-14-92 16:00	12-14-92 16:00	12-15-92 08:00	12-15-92 08:00	12-15-92 11:00	12-15-92 11:12	JPF
71	"	"	"	"	"	"	"	"	11:20	11:22	JPF

NOTE: Reference appendix for strip chart of Temperature vs Time cure profile, Humidity and Temperature vs Time aging plots, for specimens.

AEROJET ASRM PVA/MB
INDIVIDUAL CURING/AGING DATE AND TIME INFORMATION

SPECIMEN NO.	BATCH #	CURE START	CURE FINISH	HUMIDITY START	HUMIDITY FINISH	DRYING START	DRYING FINISH	COOL START	COOL FINISH	TEST TIME	TECH
TEN-75F-90%(DRIED)-.05-73	13	12-07-92 08:10	12-08-92 08:00	12-09-92 16:00	12-14-92 16:00	12-14-92 16:00	12-15-92 08:00	12-15-92 08:00	12-15-92 11:45	12-15-92 11:46	JPF
74	14	12-07-92 16:00	"	"	"	"	"	"	13:00	13:08	JPF
75	"	"	"	"	"	"	"	"	13:20	13:21	JPF
76	"	"	"	"	"	"	"	"	13:30	13:32	JPF
77	"	"	"	"	"	"	"	"	13:40	13:50	JPF
TEN-75F-90%-.05-88	13	12-9-92 9:00	12-10-92 8:00	12-10-92 8:10	12-15-92 09:05	--	--	--	--	09:16	JPF
89	"	"	"	"	12-15-92 09:25	--	--	--	--	09:28	JPF

NOTE: Reference appendix for strip chart of Temperature vs Time cure profile, Humidity and Temperature vs Time aging plots, for specimens.

AEROJET ASRM PVA/MB
INDIVIDUAL CURING/AGING DATE AND TIME INFORMATION

SPECIMEN NO.	BATCH #	CURE START	CURE FINISH	HUMIDITY START	HUMIDITY FINISH	DRYING START	DRYING FINISH	COOL START	COOL FINISH	TEST TIME	TECH
TEN-75F-90%-.25-90	14	12-09-92 16:30	12-10-92 08:00	12-10-92 08:10	12-15-92 09:35	--	--	--	--	12-15-92 09:38	JPF
TEN-75F-90% 2.0-92	"	"	"	"	12-15-92 09:55	--	--	--	--	10:00	JPF
93	"	"	"	"	12-15-92 10:20	--	--	--	--	10:37	JPF
TEN-75F-90%-.05-94	"	12-10-92 09:30	12-11-92 08:00	12-11-92 08:10	12-16-92 10:50	--	--	--	--	12-16-92 11:00	JPF
95	"	"	"	"	12-16-92 11:05	--	--	--	--	11:12	JPF
96	"	"	"	"	12-16-92 11:15	--	--	--	--	11:25	JPF
TEN-75F-90%-.05-98	16	12-10-92 16:00	12-11-92 08:00	12-11-92 08:10	12-16-92 11:45	--	--	--	--	12-16-92 11:50	JPF
TEN-75F-90%-.25-99	"	"	"	"	12-16-92 13:05	--	--	--	--	13:12	JPF
TEN-75F-90%-2.0-100	"	"	"	"	12-16-92 13:55	--	--	--	--	14:10	JPF
TEN-75F-90%-.25-101	"	"	"	"	12-16-92 13:15	--	--	--	--	13:21	JPF
102	"	12-11-92 08:30	12-11-92 15:15	12-11-92 15:20	12-16-92 13:25	--	--	--	--	13:30	JPF
TEN-75F-90%-2.0-103	"	"	"	"	12-16-92 13:35	--	--	--	--	13:41	JPF
104	"	"	"	"	12-16-92 13:47	--	--	--	--	13:51	JPF

AEROJET ASRM PVA/MB
INDIVIDUAL CURING/AGING DATE AND TIME INFORMATION

SPECIMEN NO.	BATCH #	CURE START	CURE FINISH	HUMIDITY START	HUMIDITY FINISH	DRYING START	DRYING FINISH	COOL START	COOL FINISH	TEST TIME	TECH
TEN-75F-90%(DRIED)-.25-106	16	12-16-92 14:40	12-17-92 08:00	12-17-92 08:30	12-22-92 15:30	12-22-92 15:35	12-23-92 7:15	12-23-93 7:15	12-23-92 8:15	8:19	JPF
107	"	"	"	"	"	"	"	"	8:30	8:33	"
108	"	"	"	"	"	"	"	"	8:42	8:43	"
TEN-75F-90%(DRIED)-.05-109	"	"	"	"	"	"	"	"	8:53	8:54	"
110	"	12-17-92 09:30	12-17-92 16:00	12-17-92 16:15	"	"	"	"	9:05	9:06	"
TEN-75F-90%(DRIED)-2.0-111	"	"	"	"	"	"	"	"	9:34	9:35	"
112	"	"	"	"	"	"	"	"	9:50	10:07	"
113	"	"	"	"	"	"	"	"	10:18	10:19	"
114	"	12-18-92 09:15	12-18-92 15:30	12-18-92 15:45	12-23-92 15:30	12-23-92 15:30	12-24-92 7:15	12-24-92 7:15	8:30	8:32	"
115	"	"	"	"	"	"	"	"	8:40	8:41	"
TEN-75F-90%(DRIED)-.25-116	"	"	"	"	"	"	"	"	8:49	8:50	"
TEN-75F-90%(DRIED)-2.0-117	"	"	"	"	"	"	"	"	9:00	9:06	"

AEROJET ASRM PVA/MB
INDIVIDUAL CURING/AGING DATE AND TIME INFORMATION

SPECIMEN NO.	BATCH #	CURE START	CURE FINISH	HUMIDITY START	HUMIDITY FINISH	DRYING START	DRYING FINISH	COOL START	COOL FINISH	TEST	TECH
CTE-DRY-1-SMALL	16	12-14-92 08:00	12-15-92 08:00	--	--	--	--	12-15-92 08:00	12-15-92 09:05	12-15-92 09:21	KRM
2-SMALL	"	"	"	--	--	--	--	"	12-15-92 10:30	12-15-92 10:45	"
3-SMALL	"	"	"	--	--	--	--	"	12-15-92 12:35	12-15-92 12:45	"
4-SMALL	"	"	"	--	--	--	--	"	12-15-92 14:13	12-15-92 14:25	"
5-SMALL	"	12-14-92 16:00	"	--	--	--	--	"	12-16-92 08:20	12-16-92 08:45	"
6-SMALL	"	"	"	--	--	--	--	"	12-16-92 10:27	12-16-92 10:40	"
7-SMALL	"	"	"	--	--	--	--	"	12-16-92 13:12	12-16-92 13:30	"
8-SMALL	"	"	"	--	--	--	--	"	12-16-92 14:40	12-16-92 14:53	"
CTE-90%-9	"	12-16-92 14:40	12-17-92 08:00	12-17-92 08:30	12-23-92 11:50	--	--	--	--	12-23-92 12:25	"
10	"	"	"	"	12-23-92 13:40	--	--	--	--	12-23-92	"
11	"	"	"	"	12-23-92 14:52	--	--	--	--	12-23-92 15:02	"
12	"	12-17-92 09:30	12-17-92 16:00	12-17-92 16:15	12-23-92 16:18	--	--	--	--	12-23-92 16:18	"
13	"	"	"	"	12-24-92 07:57	--	--	--	--	12-24-92 08:07	RSH
14	"	"	"	"	12-24-92 09:08	--	--	--	--	12-24-92 09:15	RSH
15	"	"	"	"	12-24-92 10:15	--	--	--	--	12-24-92 10:21	RSH

NOTE: Reference appendix for strip chart of Temperature vs Time cure profile, Humidity and Temperature vs Time aging plots, for specimens.

AEROJET ASRM PVA/MB

INDIVIDUAL CURING/AGING DATE AND TIME INFORMATION

SPECIMEN NO.	BATCH #	CURE START	CURE FINISH	HUMIDITY START	HUMIDITY FINISH	DRYING START	DRYING FINISH	COOL START	COOL FINISH	TEST	TECH
CTE-90%(DRIED) - 20	17	12-22-92 08:00	12-23-92 15:15	12-23-92 15:40	12-28-92 15:00	12-28-92 15:00	12-29-92 07:50	12-29-92 07:50	12-29-92 07:50	12-29-92 08:05	RSH
21	"	"	"	"	"	"	"	"	12-29-92 09:30	12-29-92 09:35	"
22	"	"	"	"	"	"	"	"	12-29-92 10:40	12-29-92 10:45	"
23	"	"	"	"	"	"	"	"	12-29-92 11:45	12-29-92 11:50	"
24	"	12-22-96 15:30	"	"	"	"	"	"	12-29-92 12:50	12-29-92 13:00	"
25	"	"	"	"	"	"	"	"	12-29-92 13:45	12-29-92 13:50	"
26	"	"	"	"	"	"	"	"	12-29-92 14:43	12-29-92 14:47	"
27	"	"	"	"	"	"	"	"	12-29-92 15:44	12-29-92 15:57	"
CTE-50%- 28	"	12-23-92 13:15	12-24-92 07:15	12-24-92 07:15	-	--	--	--	--	12-30-92 15:10	"
29	"	"	"	"	-	--	--	--	--	12-30-92 16:55	KRM
30	"	"	"	"	-	--	--	--	--	12-31-92 07:20	RSH
31	"	"	"	"	-	--	--	--	--	12-31-92 9:25	"

NOTE: Reference appendix for strip chart of Temperature vs Time cure profile, Humidity and Temperature vs Time aging plots, for specimens.

AEROJET ASRM PVA/MB
INDIVIDUAL CURING/AGING DATE AND TIME INFORMATION

SPECIMEN NO.	BATCH #	CURE START	CURE FINISH	HUMIDITY START	HUMIDITY FINISH	DRYING START	DRYING FINISH	COOL START	COOL FINISH	TEST	TECH
CTE-50%-32	17	12-24-92 08:00	12-24-92 12:00	12-24-92 12:00	--	--	--	--	--	12-31-92 8:20	RSH
33	"	"	"	"	--	--	--	--	--	12-31-92 10:30	"
34	"	"	"	"	--	--	--	--	--	12-31-92 11:20	"
35	"	"	"	"	--	--	--	--	--	12-31-92 12:45	"
CTE-DRY-36	"	12-29-92 08:00	12-30-92 07:15	--	--	--	--	12-30-92 07:15	12-30-92 07:15	12-30-92 07:20	RSH
37	"	"	"	--	--	--	--	"	12-30-92 08:15	12-30-92 08:20	"
38	"	"	"	--	--	--	--	"	12-30-92 09:10	12-30-92 09:15	"
39	"	"	"	--	--	--	--	"	12-30-92 10:10	12-30-92 10:15	"
40	"	12-29-92 13:30	"	--	--	--	--	"	12-30-92 11:05	12-30-92 11:10	"
41	"	"	"	--	--	--	--	"	12-30-92 12:00	12-30-92 12:05	"
42	"	"	"	--	--	--	--	"	12-30-92 13:00	12-30-92 13:05	"
43	"	"	"	--	--	--	--	"	12-30-92 14:05	12-30-92 14:10	"

NOTE: Reference appendix for strip chart of Temperature vs Time cure profile, Humidity and Temperature vs Time aging plots, for specimens.

HIGH HUMIDITY AGING WET AND DRY BULB MEASUREMENTS

HIGH HUMIDITY AGING WET AND DRY BULB MEASUREMENTS

SPECIMEN NO.	DATE, TIME	DRY BULB TEMP (°F)	WET BULB TEMP (°F)	RELATIVE HUMIDITY (%)
CMP #1 thru #10	11/06/92 14:00	90	87	90
	11/09/92 08:00	90	87	90
	11/10/92 08:00	90	87	90
	11/11/92 08:00	90	87	90
	11/11/92 16:00	90	87	90

Chamber #1

HIGH HUMIDITY AGING WET AND DRY BULB MEASUREMENTS

SPECIMEN NO.	DATE, TIME	DRY BULB TEMP (°F)	WET BULB TEMP (°F)	RELATIVE HUMIDITY (%)
CMP #11 thru #20	11/11/92 16:00	90	87	90
	11/12/92 08:00	90	87	90
	11/13/92 08:00	90	87	90
	11/16/92 08:00	90	87	90
	11/16/92 16:00	90	87	90

Chamber #1

HIGH HUMIDITY AGING WET AND DRY BULB MEASUREMENTS

SPECIMEN NO.	DATE, TIME	DRY BULB TEMP (°F)	WET BULB TEMP (°F)	RELATIVE HUMIDITY (%)
CMP #21 thru #30	11/12/92 08:00	90	87	90
	11/13/92 08:00	90	87	90
	11/16/92 08:00	90	87	90
	11/17/92 08:00	90	87	90

Chamber #2

Note: Wet and dry bulb measurements only taken periodically.
High humidity chamber runs reliably for months without adjustment as preset conditions.

HIGH HUMIDITY AGING WET AND DRY BULB MEASUREMENTS

SPECIMEN NO.	DATE, TIME	DRY BULB TEMP (°F)	WET BULB TEMP (°F)	RELATIVE HUMIDITY (%)
TEN #70 thru #85	12/09/92 16:00	90	87	90
	12/10/92 08:00	90	87	90
	12/11/92 08:00	90	87	90
	12/14/92 08:00	90	87	90
	12/15/92 16:00	90	87	90

Chamber #1

HIGH HUMIDITY AGING WET AND DRY BULB MEASUREMENTS

SPECIMEN NO.	DATE, TIME	DRY BULB TEMP (°F)	WET BULB TEMP (°F)	RELATIVE HUMIDITY (%)
TEN #86 thru #93	12/10/92 08:00	90	87	90
	12/11/92 08:00	90	87	90
	12/14/92 08:00	90	87	90
	12/15/92 08:00	90	87	90

Chamber #1

HIGH HUMIDITY AGING WET AND DRY BULB MEASUREMENTS

SPECIMEN NO.	DATE, TIME	DRY BULB TEMP (°F)	WET BULB TEMP (°F)	RELATIVE HUMIDITY (%)
TEN #94 thru #101	12/11/92 08:10	90	87	90
	12/14/92 08:00	90	87	90
	12/15/92 08:00	90	87	90
	12/16/92 08:00	90	87	90

Chamber #2

HIGH HUMIDITY AGING WET AND DRY BULB MEASUREMENTS

SPECIMEN NO.	DATE, TIME	DRY BULB TEMP (°F)	WET BULB TEMP (°F)	RELATIVE HUMIDITY (%)
TEN #102 thru #105	12/11/92 15:20	90	87	90
	12/14/92 08:00	90	87	90
	12/15/92 08:00	90	87	90
	12/16/92 08:00	90	87	90

Chamber #2

Note: Wet and dry bulb measurements only taken periodically.
High humidity chamber runs reliably for months without adjustment as preset conditions.

HIGH HUMIDITY AGING WET AND DRY BULB MEASUREMENTS

SPECIMEN NO.	DATE, TIME	DRY BULB TEMP (°F)	WET BULB TEMP (°F)	RELATIVE HUMIDITY (%)
TEN #106 thru #109	12/17/92 08:30	90	87	90
	12/18/92 08:00	90	87	90
	12/21/92 08:00	90	87	90
	12/22/92 15:30	90	87	90

Chamber #1

HIGH HUMIDITY AGING WET AND DRY BULB MEASUREMENTS

SPECIMEN NO.	DATE, TIME	DRY BULB TEMP (°F)	WET BULB TEMP (°F)	RELATIVE HUMIDITY (%)
TEN #110 thru #113	12/17/92 16:15	90	87	90
	12/18/92 08:00	90	87	90
	12/21/92 08:00	90	87	90
	12/22/92 15:30	90	87	90

Chamber #1

HIGH HUMIDITY AGING WET AND DRY BULB MEASUREMENTS

SPECIMEN NO.	DATE, TIME	DRY BULB TEMP (°F)	WET BULB TEMP (°F)	RELATIVE HUMIDITY (%)
TEN #114 thru #117	12/18/92 15:45	90	87	90
	12/21/92 08:00	90	87	90
	12/23/92 15:30	90	87	90

Chamber #1

Note: Wet and dry bulb measurements only taken periodically.
High humidity chamber runs reliably for months without adjustment as preset conditions.

HIGH HUMIDITY AGING WET AND DRY BULB MEASUREMENTS

SPECIMEN NO.	DATE, TIME	DRY BULB TEMP (°F)	WET BULB TEMP (°F)	RELATIVE HUMIDITY (%)
CTE #9 thru #11	12/17/92 08:30	90	87	90
	12/18/92 08:00	90	87	90
	12/21/92 08:00	90	87	90
	12/23/92 08:00	90	87	90

Chamber #1

HIGH HUMIDITY AGING WET AND DRY BULB MEASUREMENTS

SPECIMEN NO.	DATE, TIME	DRY BULB TEMP (°F)	WET BULB TEMP (°F)	RELATIVE HUMIDITY (%)
CTE #12 thru #15	12/17/92 16:15	90	87	90
	12/18/92 08:00	90	87	90
	12/21/92 08:00	90	87	90
	12/23/92 08:00	90	87	90
	12/24/92 08:00	90	87	90

Chamber #1

HIGH HUMIDITY AGING WET AND DRY BULB MEASUREMENTS

SPECIMEN NO.	DATE, TIME	DRY BULB TEMP (°F)	WET BULB TEMP (°F)	RELATIVE HUMIDITY (%)
CTE #20 thru #27	12/23/92 15:40	90	87	90
	12/28/92 16:00	90	87	90

Chamber #1

Note: Wet and dry bulb measurements only taken periodically.
High humidity chamber runs reliably for months without adjustment as preset conditions.

INDIVIDUAL DIMENSIONAL MEASUREMENTS

INDIVIDUAL COMPRESSIVE DIMENSIONAL AND WEIGHT MEASUREMENTS

SPECIMEN NO.	LENGTH (in)	DIA (in)	VOLUME (cm^3)	CURE WEIGHT (g)	CURE DENSITY (g/cm^3)	WET WEIGHT (g)	WET DENSITY (g/cm^3)	DRIED WEIGHT (g)	DRIED DENSITY (g/cm^3)	AREA (in^2)	MAX LOAD lbs
CMP-75F-90%(DRIED)-0.05-1	6.007	3.015	702.8	312.2	0.4442	313.0	0.4454	311.9	0.4438	7.139	5897
2	6.005	3.034	711.4	312.4	0.4391	313.3	0.4404	312.0	0.4386	7.230	6795
3	6.004	3.041	714.6	317.0	0.4436	318.0	0.4450	316.8	0.4433	7.263	6403
4	6.006	3.038	713.4	317.1	0.4445	318.4	0.4463	316.9	0.4442	7.249	6546
5	6.004	3.043	715.5	311.0	0.4347	311.7	0.4356	310.7	0.4342	7.273	5477
6	6.007	3.032	710.7	316.8	0.4458	317.7	0.4470	316.5	0.4453	7.220	7298
7	6.005	3.055	721.3	317.4	0.4400	318.5	0.4416	317.1	0.4396	7.330	5552
8	6.005	3.060	723.7	321.6	0.4444	322.5	0.4456	321.4	0.4441	7.354	7388
9	6.008	3.016	703.4	317.3	0.4511	318.0	0.4521	317.0	0.4507	7.144	5964
10	5.997	3.020	703.9	314.3	0.4465	315.2	0.4478	314.0	0.4461	7.163	5905
CMP-75F-90%(DRIED)-.25-11	6.010	3.022	706.4	318.7	0.4512	319.9	0.4528	318.4	0.4507	7.173	7928
12	6.010	3.018	7.045	317.2	0.4502	318.5	0.4521	316.9	0.4498	7.154	7314
13	5.998	3.042	714.4	318.3	0.4455	319.4	0.4471	317.9	0.4450	7.268	7308
14	6.010	3.018	704.5	319.1	0.4529	320.3	0.4546	318.9	0.4527	7.154	8123
15	5.998	3.041	713.9	314.9	0.4411	316.1	0.4428	314.6	0.4407	7.263	6093
CMP-75F-90%(DRIED)-2.0-16	6.010	3.038	713.9	313.6	0.4393	314.7	0.4408	313.4	0.4390	7.249	6560
17	5.996	3.038	712.2	320.4	0.4499	321.5	0.4514	320.0	0.4493	7.249	8867
18	5.997	3.005	697.0	315.8	0.4531	316.9	0.4547	315.5	0.4526	7.092	7577
19	5.997	3.001	695.1	315.0	0.4532	315.9	0.4545	314.7	0.4527	7.073	6743
20	6.010	3.025	707.8	317.3	0.4483	318.3	0.4497	317.1	0.4480	7.187	8494

INDIVIDUAL COMPRESSIVE DIMENSIONAL AND WEIGHT MEASUREMENTS

SPECIMEN NO.	LENGTH (in)	DIA (in)	VOLUME (cm^3)	CURE WEIGHT (g)	CURE DENSITY (g/cm^3)	WET WEIGHT (g)	WET DENSITY (g/cm^3)	DRIED WEIGHT (g)	DRIED DENSITY (g/cm^3)	AREA (in^2)	MAX LOAD lbs
CMP-75F-90%-0.05-21	6.002	3.036	712.0	312.7	0.4392	314.4	0.4416	-	-	7.239	3425
22	6.008	3.030	709.9	315.9	0.4450	317.6	0.4474	-	-	7.211	3737
23	6.006	3.035	712.0	316.0	0.4438	317.8	0.4463	-	-	7.234	3998
24	6.001	3.046	716.6	322.8	0.4505	324.5	0.4528	-	-	7.287	4257
25	6.003	3.035	711.7	314.7	0.4422	316.2	0.4443	-	-	7.234	3634
CMP-75F-90%-0.25-26	6.002	3.030	709.2	314.2	0.4430	316.0	0.4456	-	-	7.211	4420
27	6.009	3.037	713.3	315.5	0.4423	317.2	0.4447	-	-	7.244	4265
28	6.004	3.029	709.0	314.8	0.4440	316.3	0.4461	-	-	7.206	3763
CMP-75F-90%-2.0- 29	6.003	3.040	714.0	314.3	0.4402	315.9	0.4424	-	-	7.258	4469
30	6.002	3.036	712.0	317.6	0.4461	319.4	0.4486	-	-	7.239	4502
CMP-75F-DRY-0.05-31	5.998	3.045	715.8	317.6	0.4437	-	-	317.1	0.4430	7.282	6889
32	5.998	3.042	714.4	315.7	0.4419	-	-	315.3	0.4413	7.268	6615
33	5.998	3.047	716.7	317.0	0.4423	-	-	316.6	0.4417	7.292	6382
CMP-7F5-DRY-0.25-34	5.998	3.046	716.2	322.7	0.4506	-	-	322.4	0.4502	7.287	7802
35	5.998	3.052	719.1	316.0	0.4394	-	-	315.7	0.4390	7.316	7085
CMP-75F-DRY-2.0- 36	5.998	3.045	715.8	317.3	0.4433	-	-	317.0	0.4429	7.282	6473
37	5.998	3.045	715.8	316.2	0.4417	-	-	315.8	0.4412	7.282	7340

INDIVIDUAL COMPRESSIVE DIMENSIONAL AND WEIGHT MEASUREMENTS

SPECIMEN NO.		LENGTH (in)	DIA (in)	VOLUME (cm^3)	CURE WEIGHT (g)	CURE DENSITY (g/cm^3)	WET WEIGHT (g)	WET DENSITY (g/cm^3)	DRIED WEIGHT (g)	DRIED DENSITY (g/cm^3)	AREA (in^2)	MAX LOAD lbs
CMP-75F-DRY-0.05-	38	6.002	3.045	716.2	329.0	.4593	-	-	-	-	7.282	7345
	39	5.997	3.040	713.3	326.1	.4572	-	-	-	-	7.258	7028
	40	6.000	3.042	714.6	321.2	.4495	-	-	-	-	7.268	6373
	41	6.000	3.035	711.3	316.7	.4452	-	-	-	-	7.234	5743
CMP-75F-DRY-0.25-	42	6.000	3.043	715.1	318.5	.4454	-	-	-	-	7.273	6910
	43	5.997	3.042	714.2	322.1	.4540	-	-	-	-	7.268	6181
	44	6.000	3.054	720.2	321.1	.4458	-	-	-	-	7.325	6714
CMP-75F-DRY-2.0-	45	5.999	3.048	717.3	320.5	.4468	-	-	-	-	7.296	6177
	46	5.999	3.040	713.5	320.5	.4492	-	-	-	-	7.258	6591
	47	5.999	3.046	716.4	322.3	.4499	-	-	-	-	7.287	6955

AEROJET ASRM PVA/MB
INDIVIDUAL CURING/AGING DATE AND TIME INFORMATION

SPECIMEN NO.	BATCH #	CURE START	CURE FINISH	HUMIDITY START	HUMIDITY FINISH	DRYING START	DRYING FINISH	COOL START	COOL FINISH	TEST TIME	TECH
TEN-75F-DRY-.05-1-OLD	9	11-20-92 08:30	11-20-92 15:00	--	--	--	--	11-20-92 15:00	11-20-92 15:00	15:14	GMV
2-OLD	"	"	"	--	--	--	--	"	"	15:23	GMV
3-OLD	"	"	"	--	--	--	--	"	"	15:32	GMV
4-OLD	"	11-20-92 16:00	11-23-92 07:30	--	--	--	--	11-23-92 07:30	11-23-92 07:30	07:47	GMV
5-OLD	"	"	"	--	--	--	--	"	"	07:56	GMV
6-OLD	"	"	"	--	--	--	--	"	"	08:05	GMV

NOTE: Reference appendix for strip chart of Temperature vs Time cure profile, Humidity and Temperature vs Time aging plots, for specimens.

INDIVIDUAL TENSILE DIMENSIONAL AND WEIGHT MEASUREMENTS

SPECIMEN NO.	WIDTH:THICK		VOLUME (cm^3)	CURE WEIGHT (g)	CURE DENSITY (g/cm^3)	WET WEIGHT (g)	WET DENSITY (g)	DRIED WEIGHT (g)	DRIED DENSITY (g/cm^3)	AREA (in^2)	MAX LOAD (lbs)
TEN-75F-DRY-.05-1-OLD	1.000	1.005	63.6	26.4	.4153	-	-	-	-	1.005	266.1
-2-OLD	1.000	1.002	63.4	26.4	.4165	-	-	-	-	1.002	289.1
-3-OLD	1.000	1.005	63.6	26.6	.4184	-	-	-	-	1.005	328.0
-4-OLD	1.000	1.004	63.5	27.0	.4251	-	-	-	-	1.004	312.6
-5-OLD	1.000	1.004	63.5	27.0	.4251	-	-	-	-	1.004	286.9
-6-OLD	1.000	1.004	63.5	27.1	.4267	-	-	-	-	1.004	297.3

The area of the mold was determined through the use of a planometer to be 3.860 in^2.
Multiplied this number by the specimen thickness for volume calculation.

INDIVIDUAL TENSILE DIMENSIONAL AND WEIGHT MEASUREMENTS

SPECIMEN NO.	LENGTH (in)	DIA (in)	VOLUME (cm^3)	CURE WEIGHT (g)	CURE DENSITY (g/cm^3)	WET WEIGHT (g)	WET DENSITY (g)	DRIED WEIGHT (g)	DRIED DENSITY (g/cm^3)	AREA (in^2)	MAX LOAD (lbs)
TEN-75-DRY-.05-48	6.23	1.002	117.9	55.7	.4724	--	--	--	--	.7895	266.3
-49	"	0.998	"	54.9	.4656	--	--	--	--	.7823	245.3
-50	"	1.000	"	55.6	.4716	--	--	--	--	.7854	259.1
-51	"	1.000	"	56.0	.4750	--	--	--	--	.7854	237.8
TEN-75F-DRY-0.25-52	"	1.010	"	54.6	.4631	--	--	--	--	.8012	264.2
-53	"	1.002	"	54.0	.4580	--	--	--	--	.7885	223.5
TEN-75F-DRY-2.0-54	"	1.002	"	54.1	.4588	--	--	--	--	.7885	171.0
-55	"	.0994	"	53.8	.4563	--	--	--	--	.7760	271.0

Reference the data reduction section for the calculation of the tensile mold volume.

INDIVIDUAL TENSILE DIMENSIONAL AND WEIGHT MEASUREMENTS

SPECIMEN NO.	LENGTH (in)	DIA (in)	VOLUME (cm^3)	CURE WEIGHT (g)	CURE DENSITY (g/cm^3)	WET WEIGHT (g)	WET DENSITY (g)	DRIED WEIGHT (g)	DRIED DENSITY (g/cm^3)	AREA (in^2)	MAX LOAD (lbs)
TEN-75F-DRY-.05-56	6.23	0.994	117.9	53.3	.4521	--	--	--	--	.7760	230.2
-57	"	1.002	"	52.7	.4470	--	--	--	--	.7885	221.2
-58	"	1.003	"	53.4	.4529	--	--	--	--	.7901	255.7
-59	"	1.002	"	53.3	.4521	--	--	--	--	.7885	250.5
TEN-75F-DRY-0.25-60	"	0.994	"	52.9	.4487	--	--	--	--	.7760	250.0
-61	"	1.000	"	52.7	.4470	--	--	--	--	.7854	287.4
-62	"	1.002	"	54.0	.4580	--	--	--	--	.7885	251.5
-63	"	1.002	"	53.9	.4572	--	--	--	--	.7885	198.7
-64	"	1.000	"	53.0	.4495	--	--	--	--	.7854	316.8
-65	"	0.994	"	53.0	.4495	--	--	--	--	.7760	243.8
TEN-75F-DRY-2.0-66	"	1.005	"	53.4	.4529	--	--	--	--	.7932	317.5
-67	"	1.002	"	52.9	.4487	--	--	--	--	.7885	248.0
-68	"	0.994	"	52.9	.4487	--	--	--	--	.7760	271.5

Reference the data reduction section for the calculation of the tensile mold volume.

INDIVIDUAL TENSILE DIMENSIONAL AND WEIGHT MEASUREMENTS

SPECIMEN NO.	LENGTH (in)	DIA (in)	VOLUME (cm^3)	CURE WEIGHT (g)	CURE DENSITY (g/cm^3)	WET WEIGHT (g)	WET DENSITY (g)	DRIED WEIGHT (g)	DRIED DENSITY (g/cm^3)	AREA (in^2)	MAX LOAD (lbs)
TEN-75F-90%(DRIED)-.05-70	6.23	1.004	117.9	?	?	?	?	54.5	.4622	.7917	300.7
71	6.23	1.002	"	?	?	?	?	53.3	.4521	.7885	275.0
73	6.23	1.006	"	?	?	?	?	55.0	.4665	.7948	299.4
74	6.23	0.994	"	?	?	?	?	54.5	.4622	.7760	310.2
75	6.23	0.994	"	?	?	?	?	53.5	.4538	.7760	291.1
76	6.23	1.000	"	?	?	?	?	53.8	.4563	.7854	210.8
77	6.23	1.002	"	?	?	?	?	55.0	.4665	.7885	318.2

Reference the data reduction section for the calculation of the tensile mold volume.

INDIVIDUAL TENSILE DIMENSIONAL AND WEIGHT MEASUREMENTS

SPECIMEN NO.	LENGTH (in)	DIA (in)	VOLUME (cm^3)	CURE WEIGHT (g)	CURE DENSITY (g/cm^3)	WET WEIGHT (g)	WET DENSITY (g)	DRIED WEIGHT (g)	DRIED DENSITY (g/cm^3)	AREA (in^2)	MAX LOAD (lbs)
TEN-75F-90%-.05-88	6.23	1.000	117.9	56.0	.4750	56.6	.4800	--	--	.7854	130.2
89	6.23	1.000	"	55.9	.4741	56.3	.4775	--	--	.7854	97.5
TEN-75F-90%-.25-90	6.23	0.995	"	54.7	.4639	55.2	.4682	--	--	.7776	122.9
TEN-75F-90%-2.0-92	6.23	1.006	"	55.8	.4733	56.4	.4784	--	--	.7948	149.9
93	6.23	1.002	"	55.2	.4682	55.8	.4733	--	--	.7885	155.3
TEN-75F-90%-.05-94	6.23	1.000	"	54.0	.4580	54.3	.4606	--	--	.7854	127.9
96	6.23	1.002	"	55.4	.4699	55.9	.4741	--	--	.7885	129.2
98	6.23	1.000	"	55.4	.4699	55.9	.4741	--	--	.7854	119.2
TEN-75F-90%-.25-99	6.23	1.000	"	54.5	.4622	55.0	.4665	--	--	.7854	158.3
TEN-75F-90%-2.0-100	6.23	1.002	"	54.7	.4639	55.0	.4665	--	--	.7885	126.5

Reference the data reduction section for the calculation of the tensile mold volume.

INDIVIDUAL TENSILE DIMENSIONAL AND WEIGHT MEASUREMENTS

SPECIMEN NO.	LENGTH (in)	DIA (in)	VOLUME (cm^3)	CURE WEIGHT (g)	CURE DENSITY (g/cm^3)	WET WEIGHT (g)	WET DENSITY (g)	DRIED WEIGHT (g)	DRIED DENSITY (g/cm^3)	AREA (in^2)	MAX LOAD (lbs)
TEN-75F-90%-.25-101	6.23	1.005	117.9	55.6	.4716	56.0	.4750	--	--	.7933	159.6
102	6.23	1.000	"	55.1	.4673	55.5	.4707	--	--	.7854	111.3
TEN-75F-90%-2.0-103	6.23	0.993	"	54.2	.4597	54.6	.4631	--	--	.7744	157.7
104	6.23	1.000	"	54.8	.4648	55.3	.4690	--	--	.7933	123.5
TEN-75F-90%(DRIED)-.25-106	6.23	1.002	"	54.2	.4597	54.7	.4639	54.2	.4597	.7885	371.8
107	6.23	1.006	"	54.6	.4631	54.9	.4656	54.5	.4622	.7948	329.2
108	6.23	1.000	"	55.2	.4682	55.6	.4716	55.2	.4682	.7854	369.2
TEN-75F-90%(DRIED)-.05-109	6.23	0.995	"	54.1	.4588	54.5	.4622	54.1	.4588	.7776	316.9
110	6.23	1.000	"	54.6	.4631	55.0	.4665	54.6	.4631	.7854	332.7
TEN-75F-90%(DRIED)-2.0-111	6.23	1.002	"	55.0	.4665	55.4	.4699	55.0	.4665	.7885	411.1
112	6.23	1.006	"	55.5	.4707	56.0	.4750	55.5	.4707	.7948	360.8
113	6.23	0.994	"	54.4	.4614	54.8	.4648	54.4	.4614	.7760	308.6
114	6.23	1.000	"	54.0	.4580	?	?	54.0	.4580	.7854	395.5
115	6.23	1.007	"	55.5	.4707	?	?	55.5	.4707	.7964	247.1
TEN-75F-90%(DRIED)-.25-116	6.23	0.996	"	55.9	.4741	?	?	55.8	.4733	.7791	427.7
TEN-75F-90%(DRIED)-2.0-117	6.23	1.002	"	55.1	.4673	?	?	55.0	.4665	.7885	379.9

Reference the data reduction section for the calculation of the tensile mold volume.

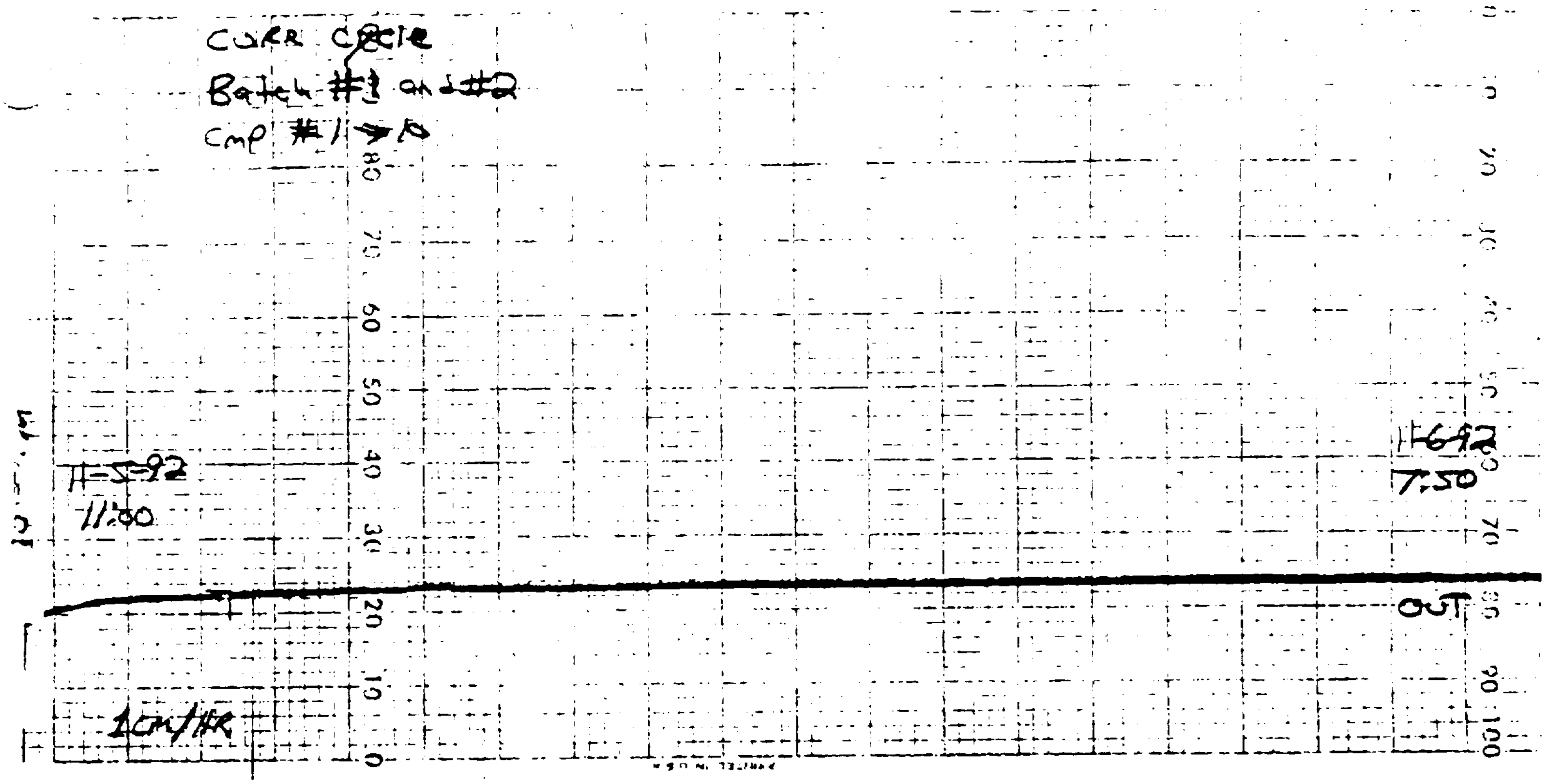
INDIVIDUAL CTE DIMENSIONAL AND WEIGHT MEASUREMENTS

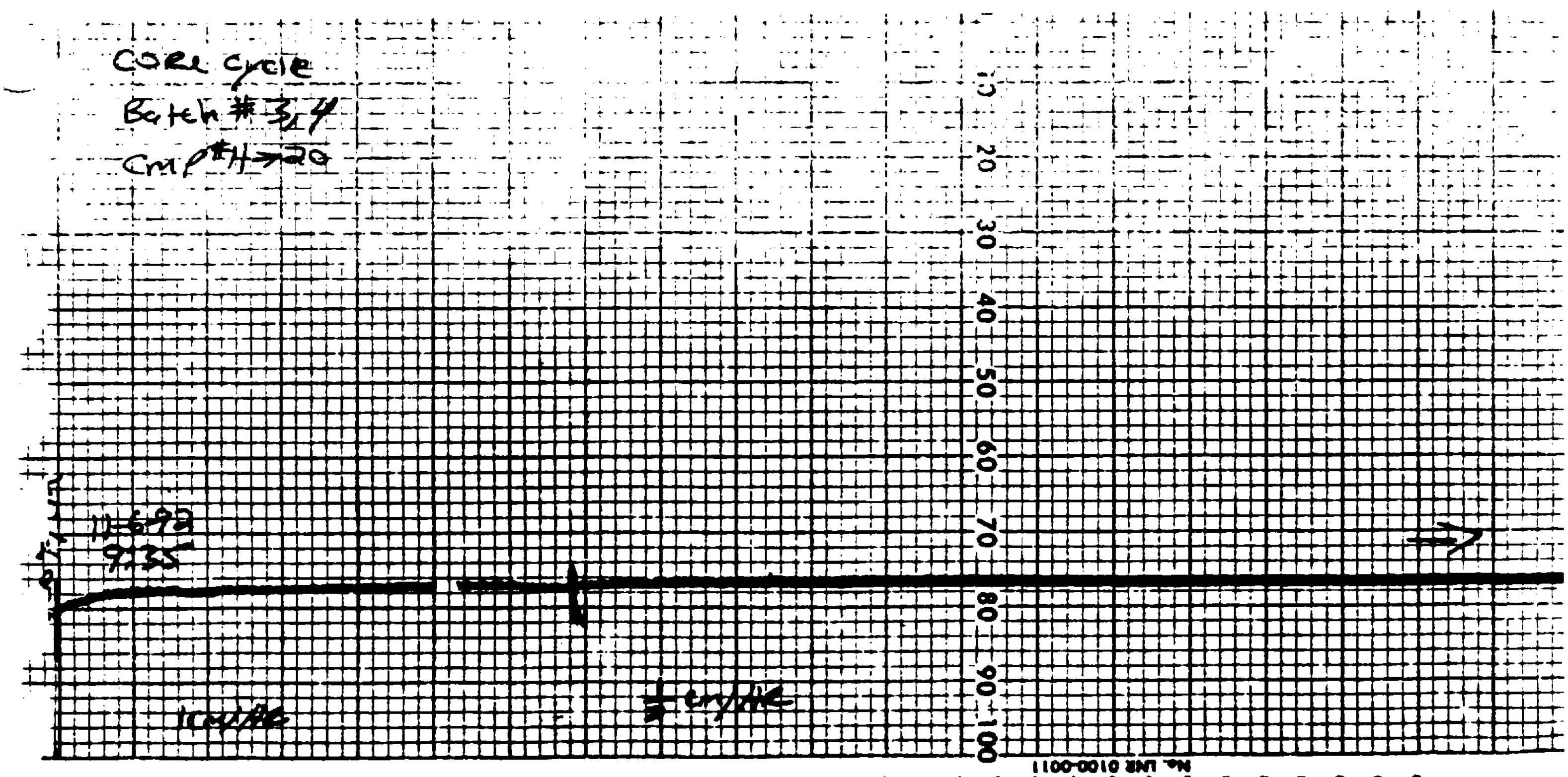
SPECIMEN NO.	LENGTH (in)	WIDTH (in)	THICK (in)	DIA (in)	VOLUME (cm^3)	CURE WEIGHT (g)	CURE DENSITY (g/cm^3)	WET WEIGHT (g)	WET DENSITY (g/cm^3)	DRIED WEIGHT (g)	DRIED DENSITY (g/cm^3)	FINAL LENGTH (in)	FURNACE
CTE-DRY-1-SMALL	2.0055	.2545	.2500	-	2.0910	0.9102	.4353	-	-	-	-	2.0051	FRONT
2	2.0022	.2525	.2576	-	2.1341	0.9015	.4224	-	-	-	-	2.0021	REAR
3	2.0084	.2581	.2518	-	2.1389	0.9450	.4418	-	-	-	-	2.0080	FRONT
4	2.0076	.2540	.2522	-	2.1074	0.9456	.4487	-	-	-	-	2.0075	REAR
5	2.0010	.2682	.2546	-	2.2391	1.0254	.4584	-	-	-	-	2.0000	REAR
6	2.0160	.2449	.2496	-	2.1019	0.9948	.4733	-	-	-	-	2.0150	FRONT
7	2.0131	.2450	.2552	-	2.0626	0.8843	.4287	-	-	-	-	2.0131	REAR
8	2.0161	.2516	.2540	-	2.1113	0.9507	.4503	-	-	-	-	2.0151	FRONT
CTE-90%-9	7.012	-	-	.751	50.90	23.1	.4538	23.4	.4599	--	--	7.013	FRONT
10	7.009	-	-	.749	50.59	23.3	.4606	23.4	.4626	--	--	7.008	REAR
11	7.009	-	-	.749	50.59	23.0	.4547	23.1	.4567	--	--	7.011	FRONT
12	7.012	-	-	.750	50.74	23.0	.4533.	23.2	.4572	--	--	7.011	REAR
13	7.008	-	-	.743	49.77	23.7	.4762	23.80	.4782	--	--	7.008	REAR
14	7.007	-	-	.749	50.57	22.8	.4509	22.91	.4530	--	--	7.012	FRONT
15	7.013	-	-	.747	50.34	22.9	.4549	23.05	.4578	--	--	7.014	REAR

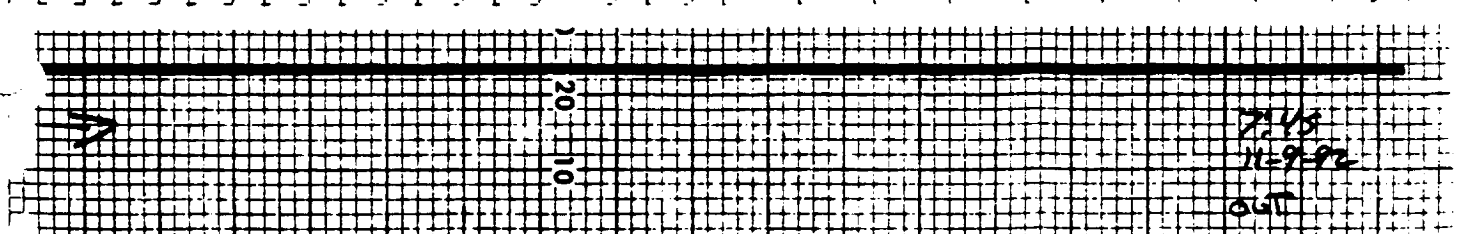
INDIVIDUAL CTE DIMENSIONAL AND WEIGHT MEASUREMENTS

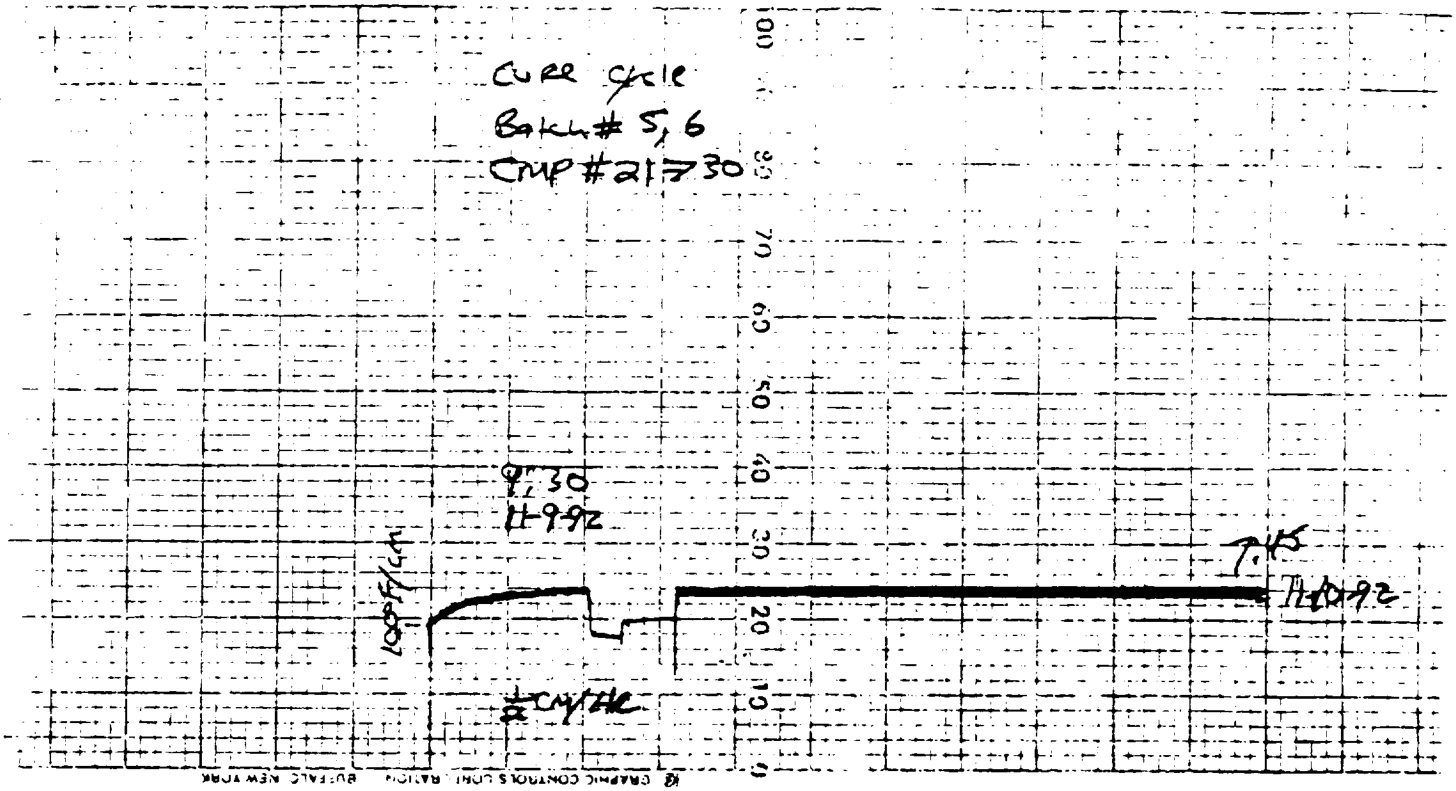
SPECIMEN NO.	LENGTH (in)	DIA. (in)	VOLUME (cm^3)	CURE WEIGHT (g)	CURE DENSITY (g/cm^3)	WET WEIGHT (g)	WET DENSITY (g/cm^3)	DRIED WEIGHT (g)	DRIED DENSITY (g/cm^3)	FINAL LENGTH (in)	FURNACE
CTE-90%(DRIED) -20	7.010	.750	50.73	22.6	.4455	22.8	.4495	22.58	.4451	7.013	FRONT
21	7.018	.746	50.25	22.5	.4478	22.7	.4518	22.52	.4482	7.021	REAR
22	7.012	.744	49.93	22.6	.4526	22.8	.4566	22.60	.4526	7.021	FRONT
23	7.008	.751	50.85	22.8	.4484	22.9	.4504	22.75	.4474	7.008	REAR
24	7.010	.750	50.73	22.7	.4475	22.9	.4514	22.68	.4471	7.015	FRONT
25	7.011	.750	50.73	22.4	.4415	22.6	.4455	22.35	.4405	7.013	REAR
26	7.012	.746	50.20	23.0	.4581	23.1	.4601	22.96	.4573	7.015	FRONT
27	7.012	.750	50.74	22.7	.4474	22.9	.4513	22.72	.4478	7.015	REAR
CTE-50%- 28	7.010	.750	50.73	22.4	.4416	--	--	--	--	7.014	FRONT
29	7.012	.750	50.74	22.6	.4454	--	--	--	--	7.012	REAR
30	7.005	.750	50.69	22.7	.4478	--	--	--	--	7.005	FRONT
31	7.010	.749	50.59	22.5	.4447	--	--	--	--	7.013	FRONT
32	7.010	.749	50.59	22.5	.4447	--	--	--	--	7.010	REAR
33	7.006	.750	50.70	22.4	.4418	--	--	--	--	7.011	FRONT
34	7.011	.748	50.46	22.9	.4538	--	--	--	--	7.012	REAR
35	7.010	.748	50.46	22.7	.4499	--	--	--	--	7.017	FRONT
CTE-DRY- 36	7.012	.745	50.07	22.3	.4454	--	--	--	--	7.014	FRONT
37	7.008	.745	50.04	22.6	.4516	--	--	--	--	7.013	REAR
38	7.016	.750	50.77	22.3	.4392	--	--	--	--	7.017	FRONT
39	7.005	.750	50.69	22.6	.4458	--	--	--	--	7.012	REAR
40	7.010	.748	50.46	22.2	.4400	--	--	--	--	7.014	FRONT
41	7.007	.750	50.71	22.0	.4339	--	--	--	--	7.013	REAR
42	7.012	.750	50.74	22.3	.4395	--	--	--	--	7.014	FRONT
43	7.010	.750	50.73	22.2	.4376	--	--	--	--	7.015	REAR

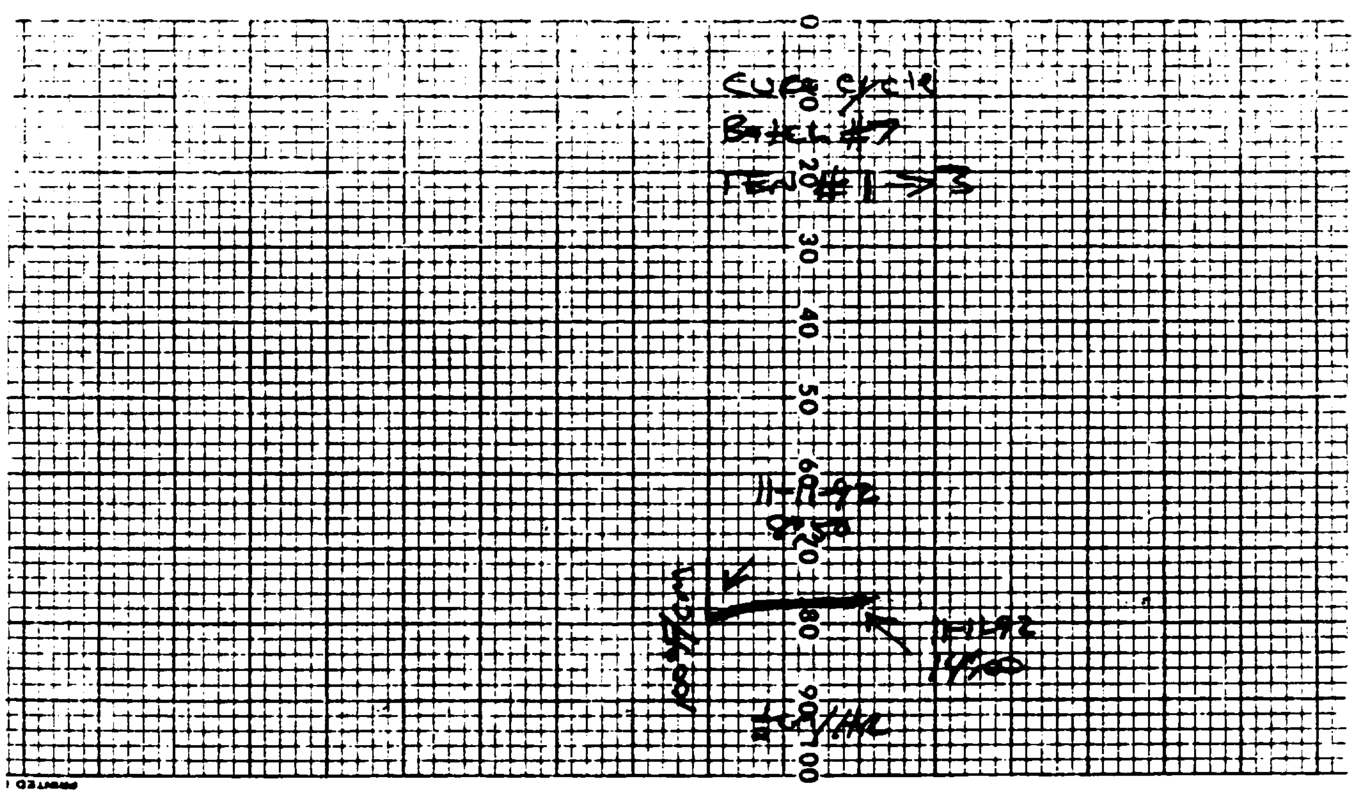
CURING AND DRYING TEMPERATURE VS TIME STRIP CHARTS

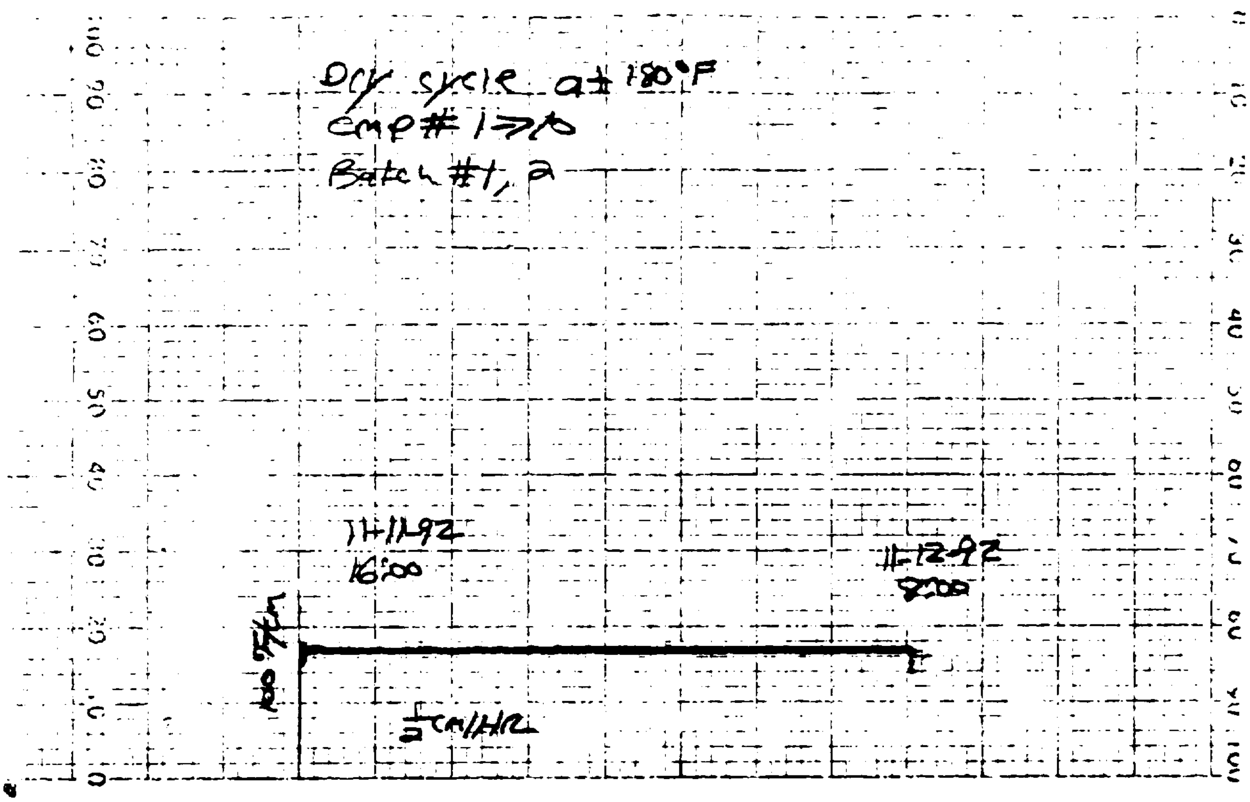

CORR Cycle
Batch #1 and #2
Cmp #1 → 10
11-5-92
11:00
11-6-92
7:50
OUT
1cm/HR

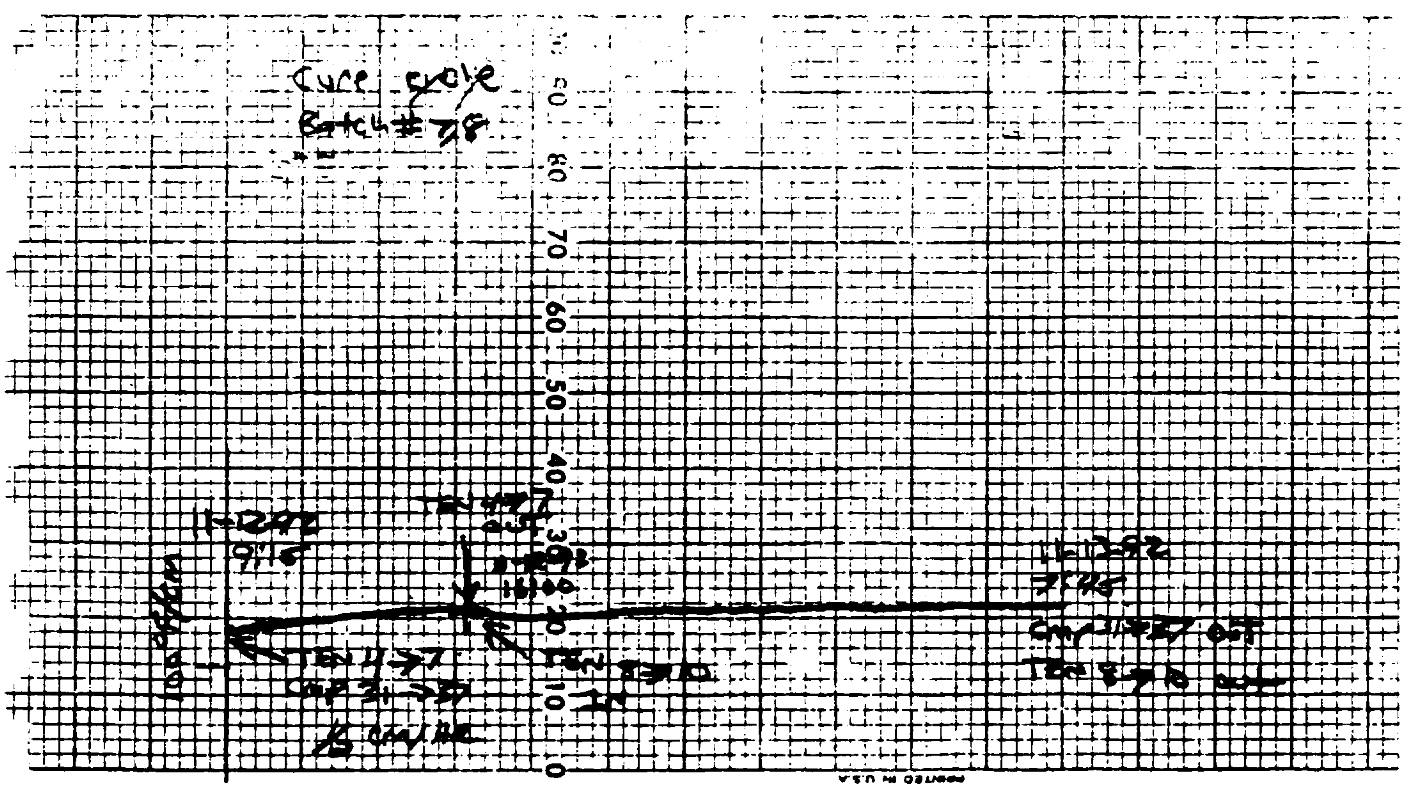

CORE cycle
Batch #3,4
Cmp #11 → 20
11-6-92
9:35
1cm/HR
1cm/HR

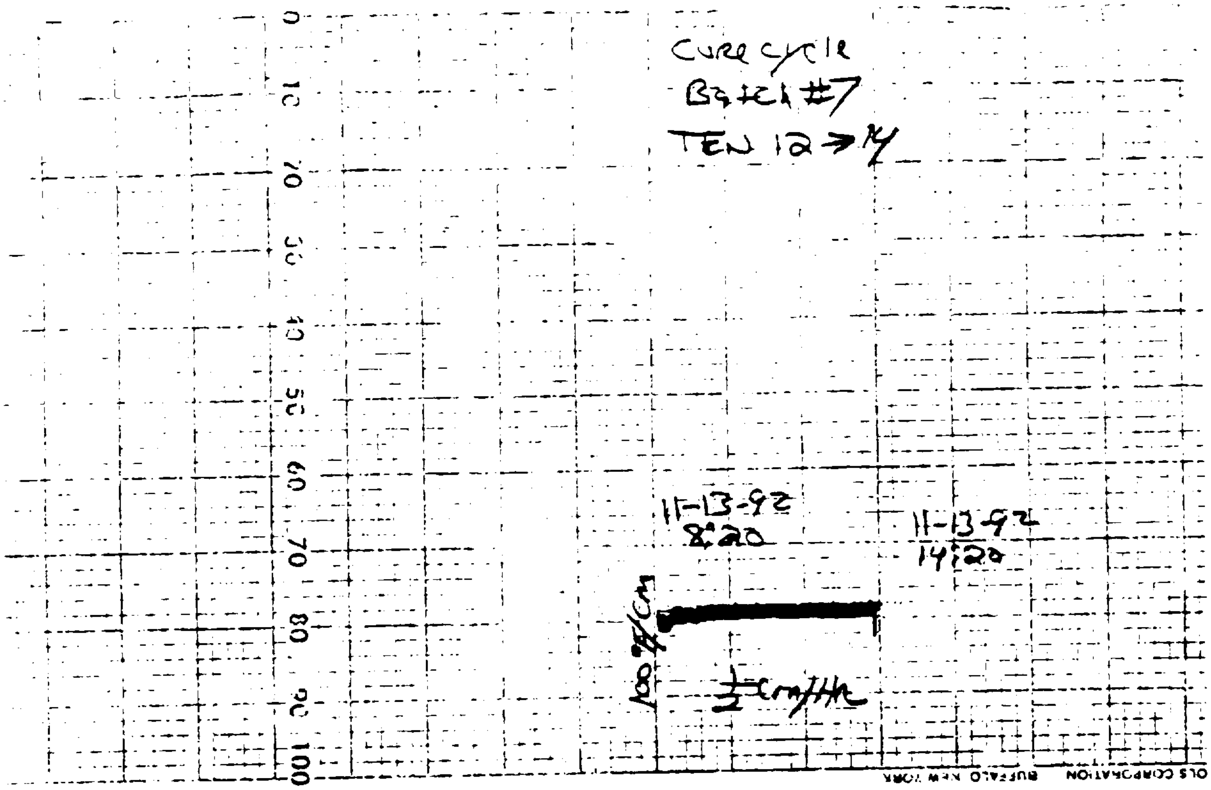

7:45
11-9-92
OUT

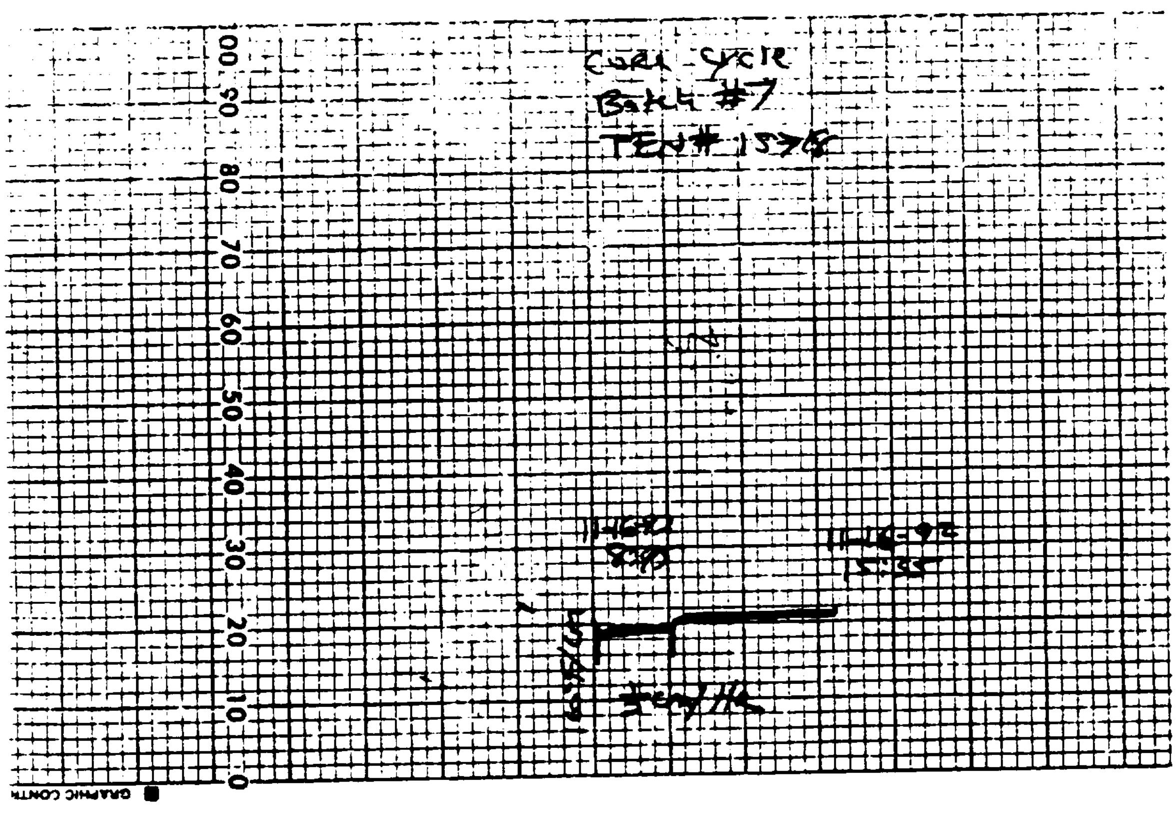

Cure cycle
Batch # 5, 6
9:30
11-9-92
7:15

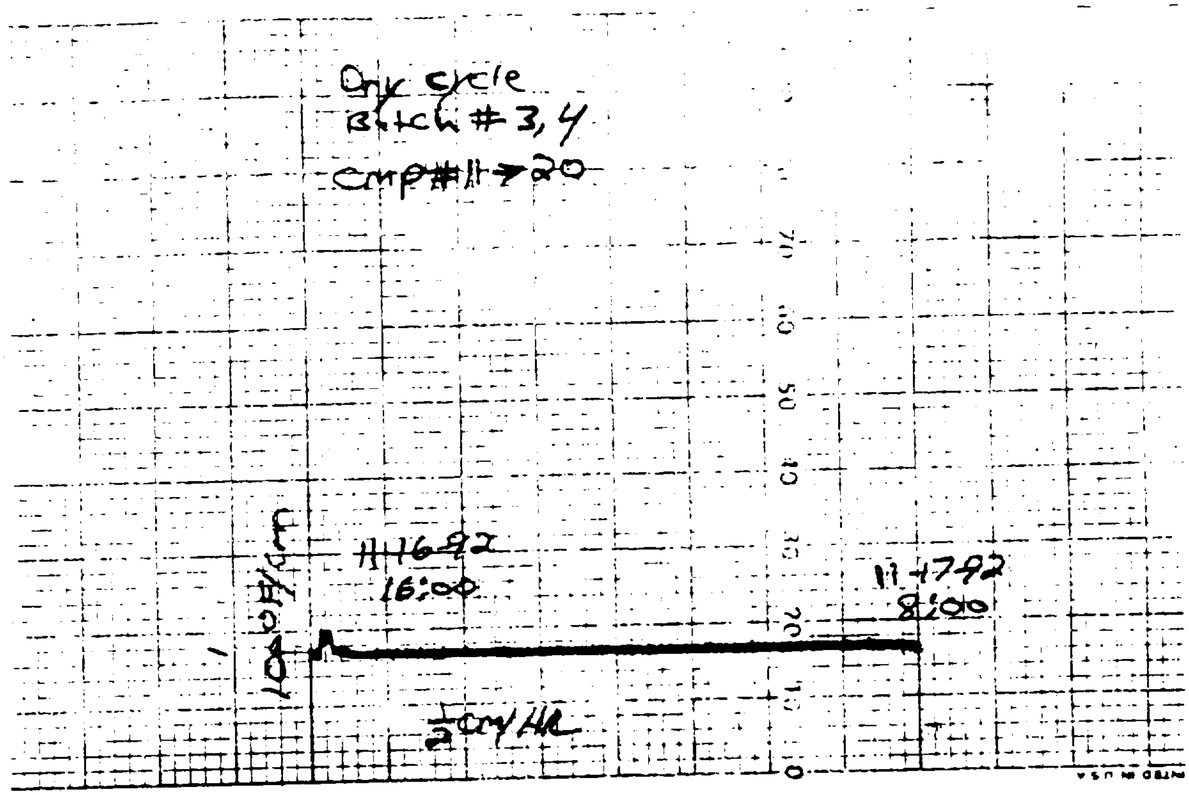

Cure cycle
Batch #7
11-11-92

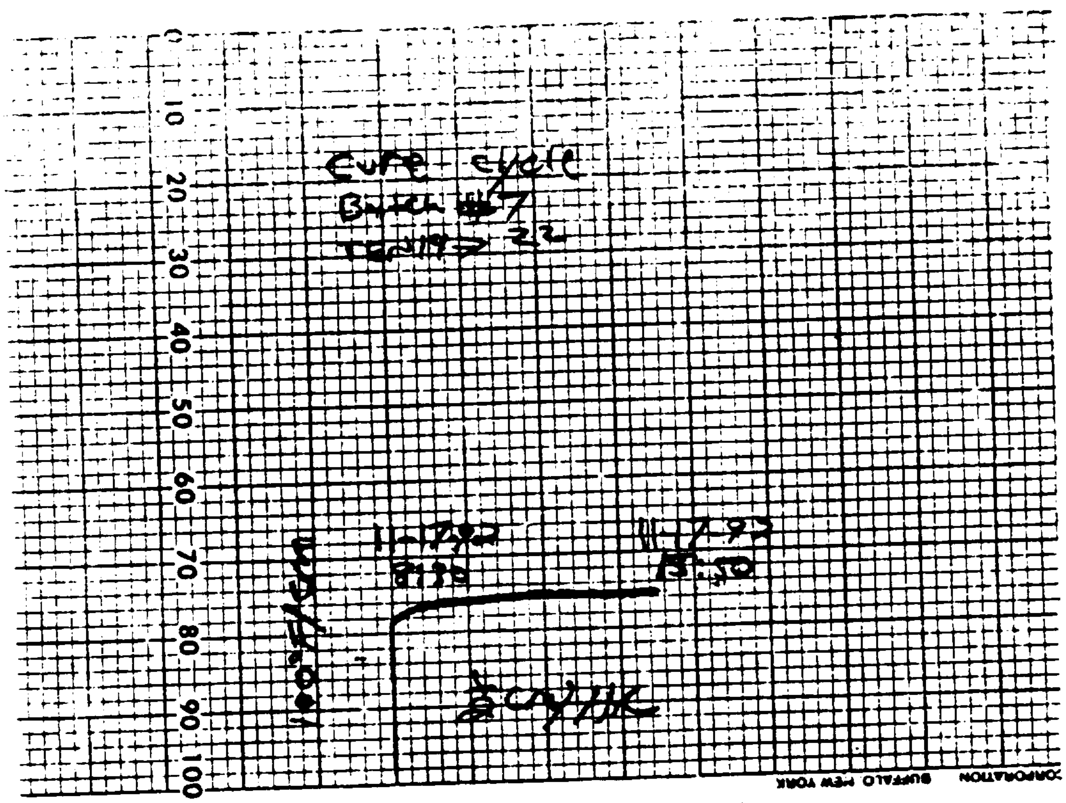

Dry sycle at 180°F
Cmp# 1->10
Batch #1, 2
11-11-92
16:00
11-12-92
8:00
½ cm/HR

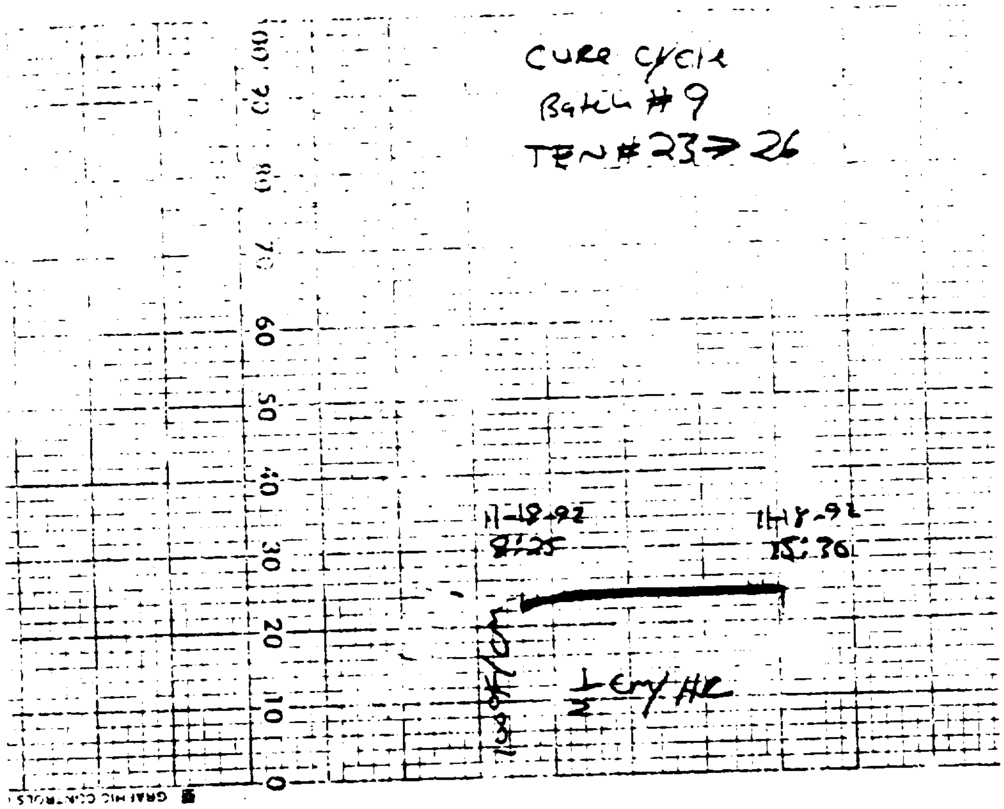

Cure cycle
Batch # 7,8
11-12-92
9:15
11-12-92
CMP 31->37 OFF
½ cm/HR

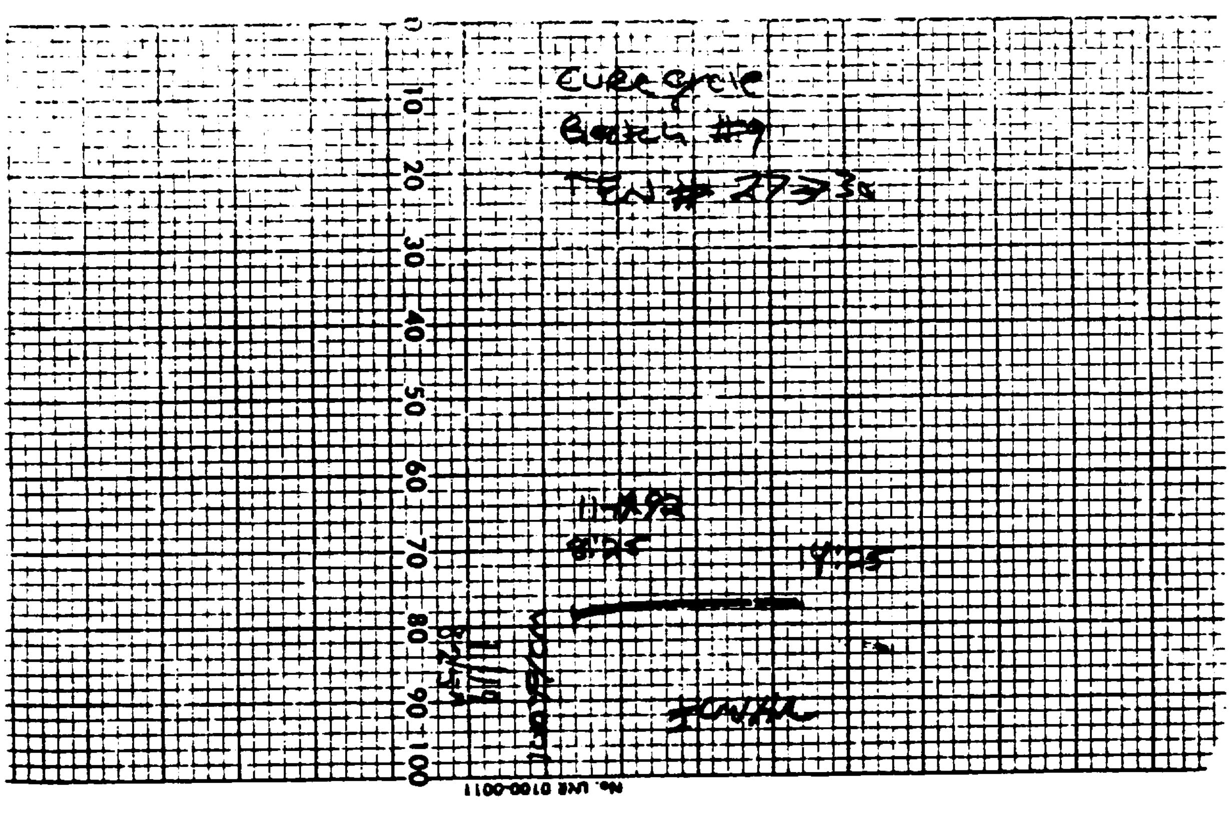

Cure cycle
Batch #7
TEN 12→14
11-13-92
8:20
11-13-92
14:20
100 #/cm
1/2 cm/hr
0
10
20
30
40
50
60
70
80
90
100

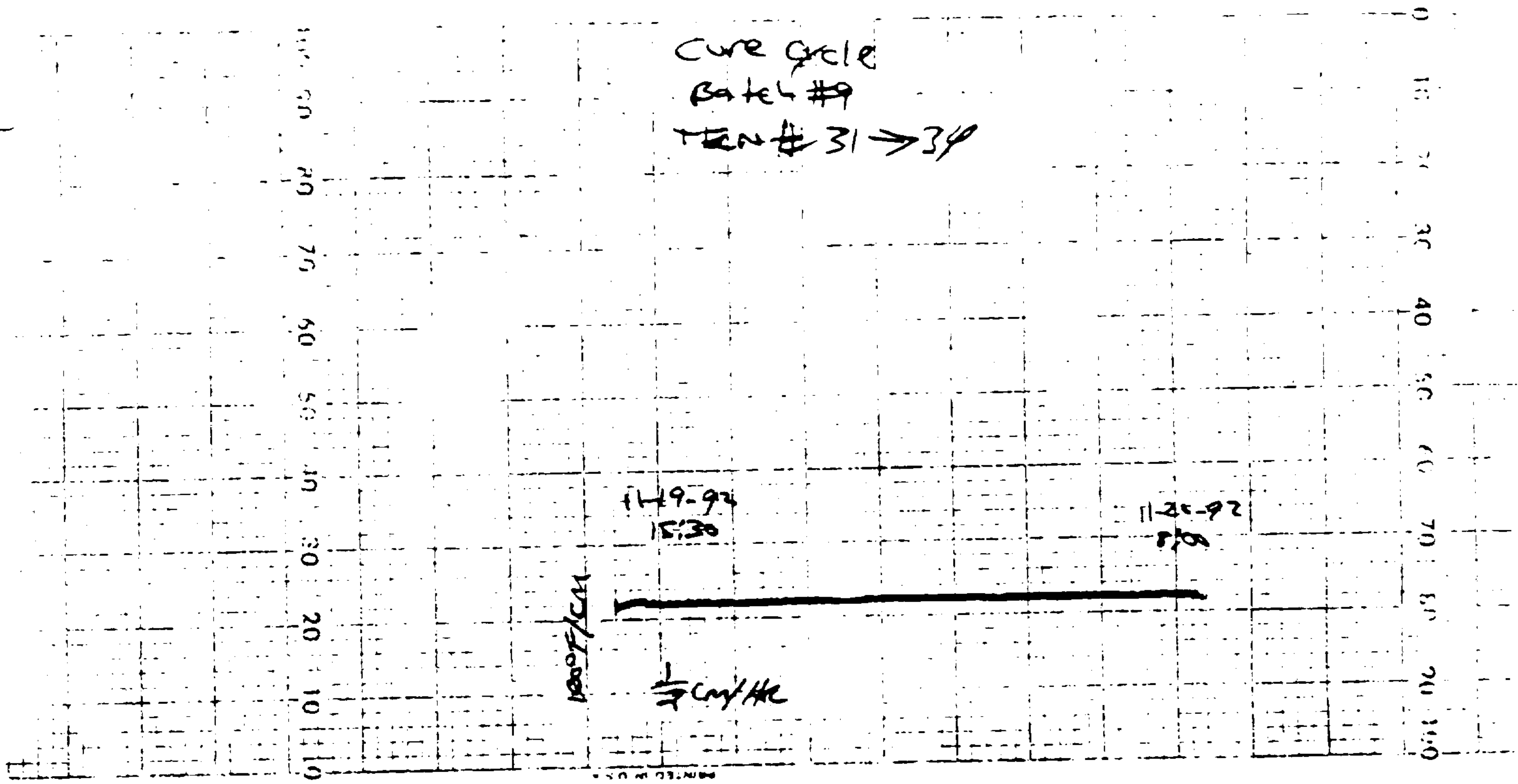

Cure cycle
Batch #7
TEN# 15→18
100
90
80
70
60
50
40
30
20
10
0

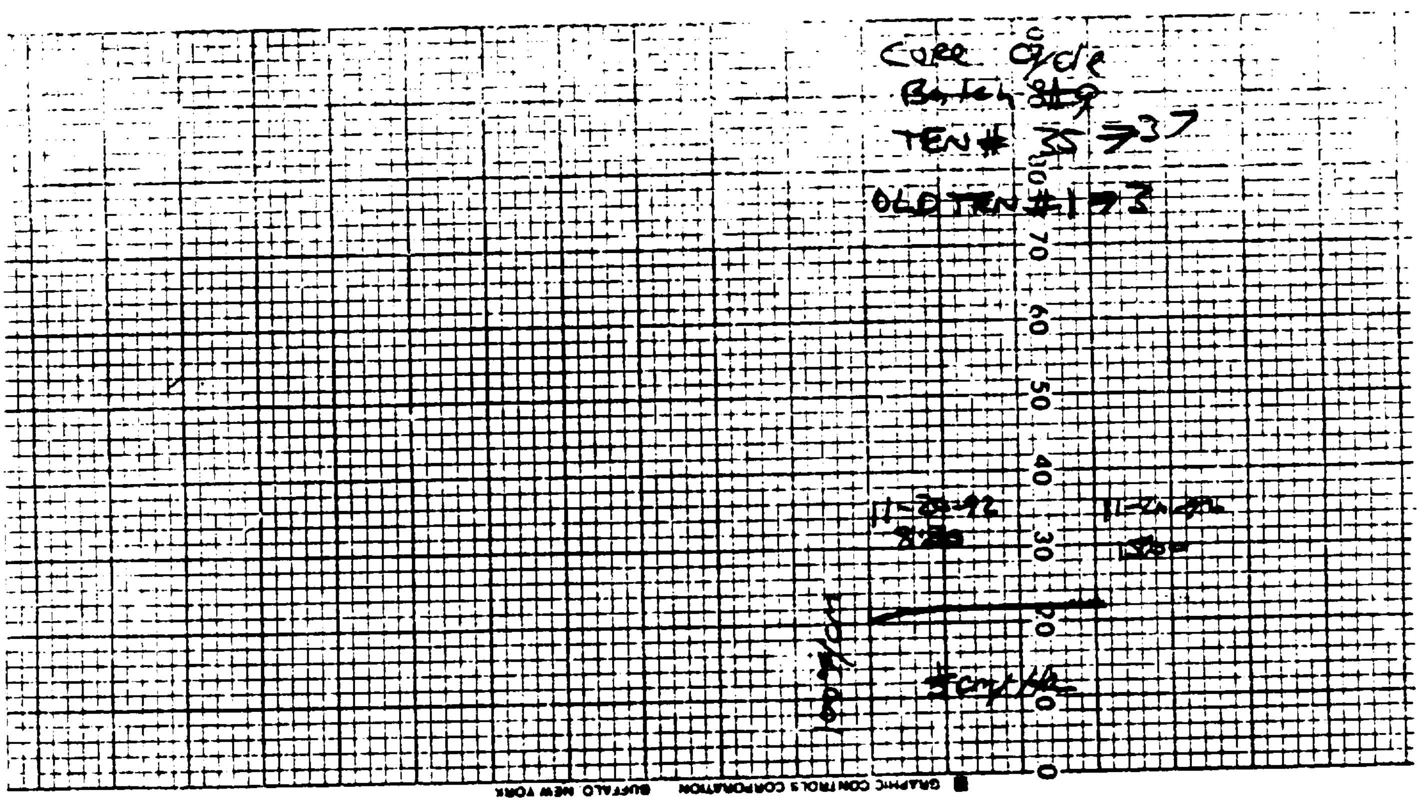

Dry cycle
Batch #3, 4
cmp#11→20
11-16-92
16:00
11-17-92
8:00

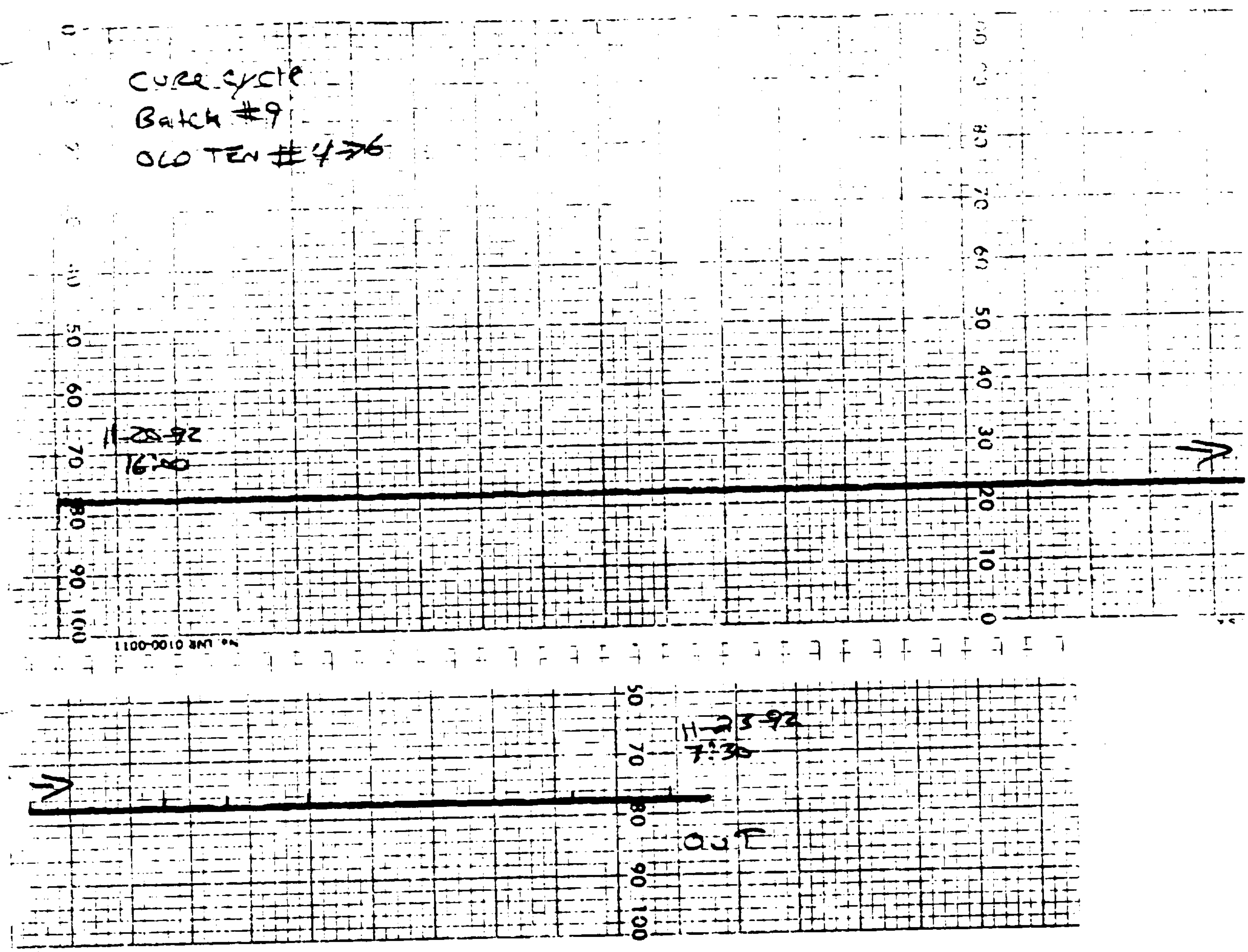

Cure cycle
Batch #7
10 20 30 40 50 60 70 80 90 100

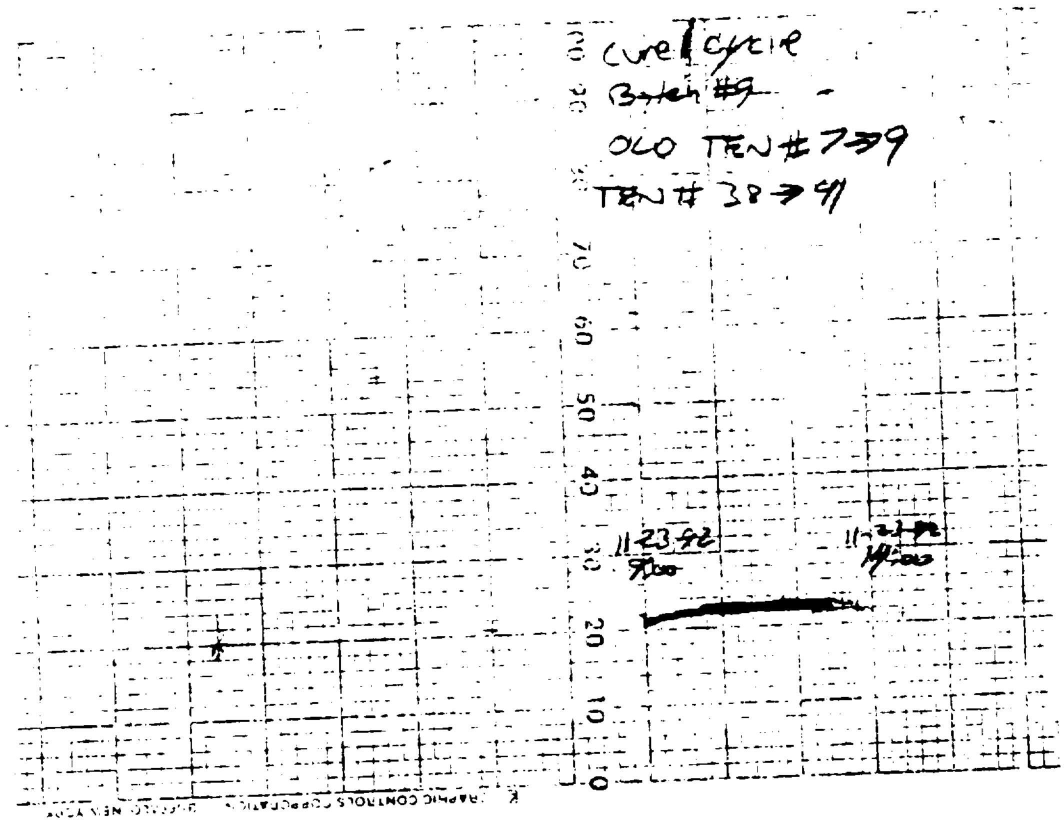

Cure Cycle
Batch #9
TEN #23 ⇒ 26
11-18-92
8:25
11-18-92
15:30
1/2 cm/HR
GRAPHIC CONTROLS

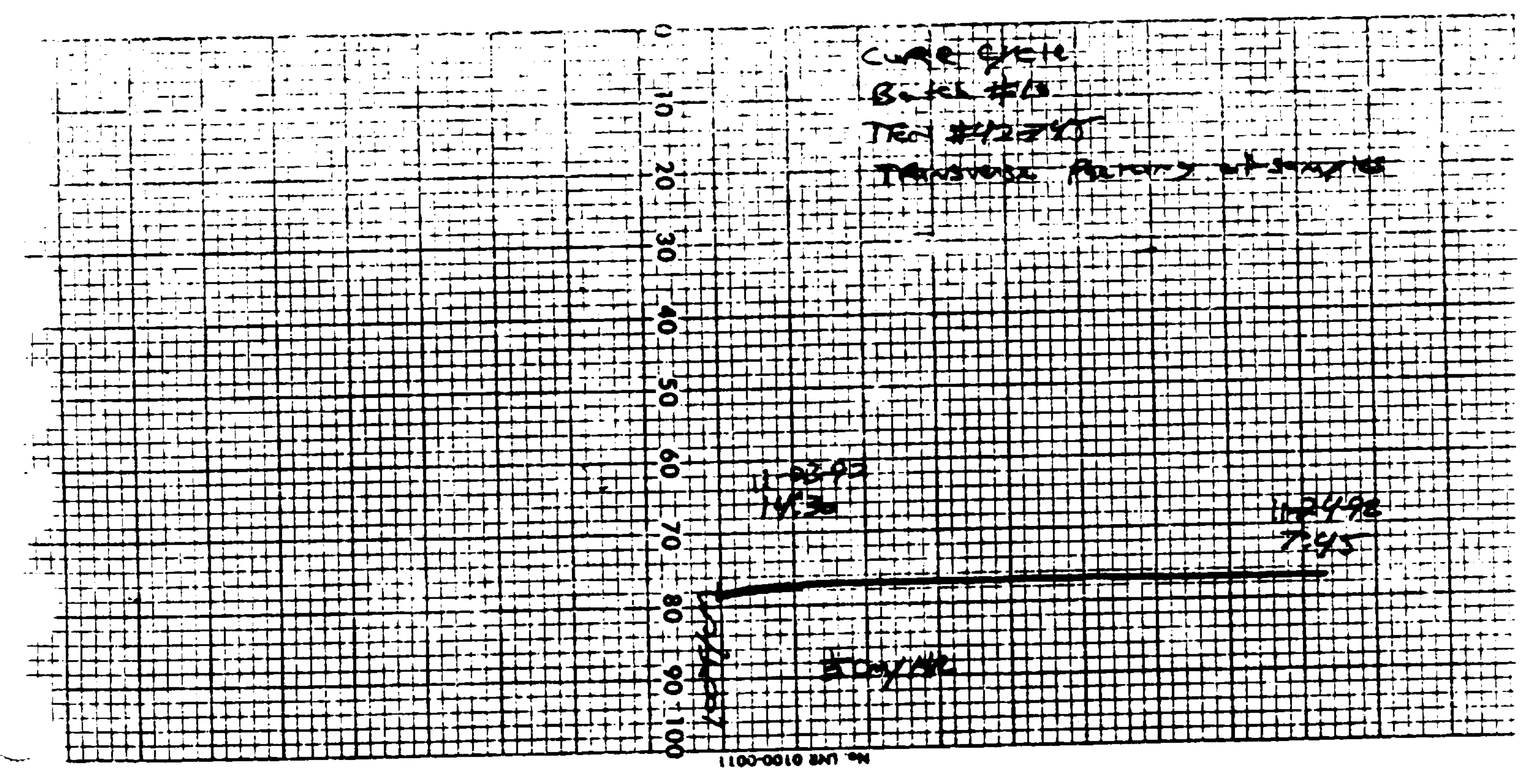

Cure Cycle
Batch #9
TEN # 27 ⇒ 30
8:25
14:05

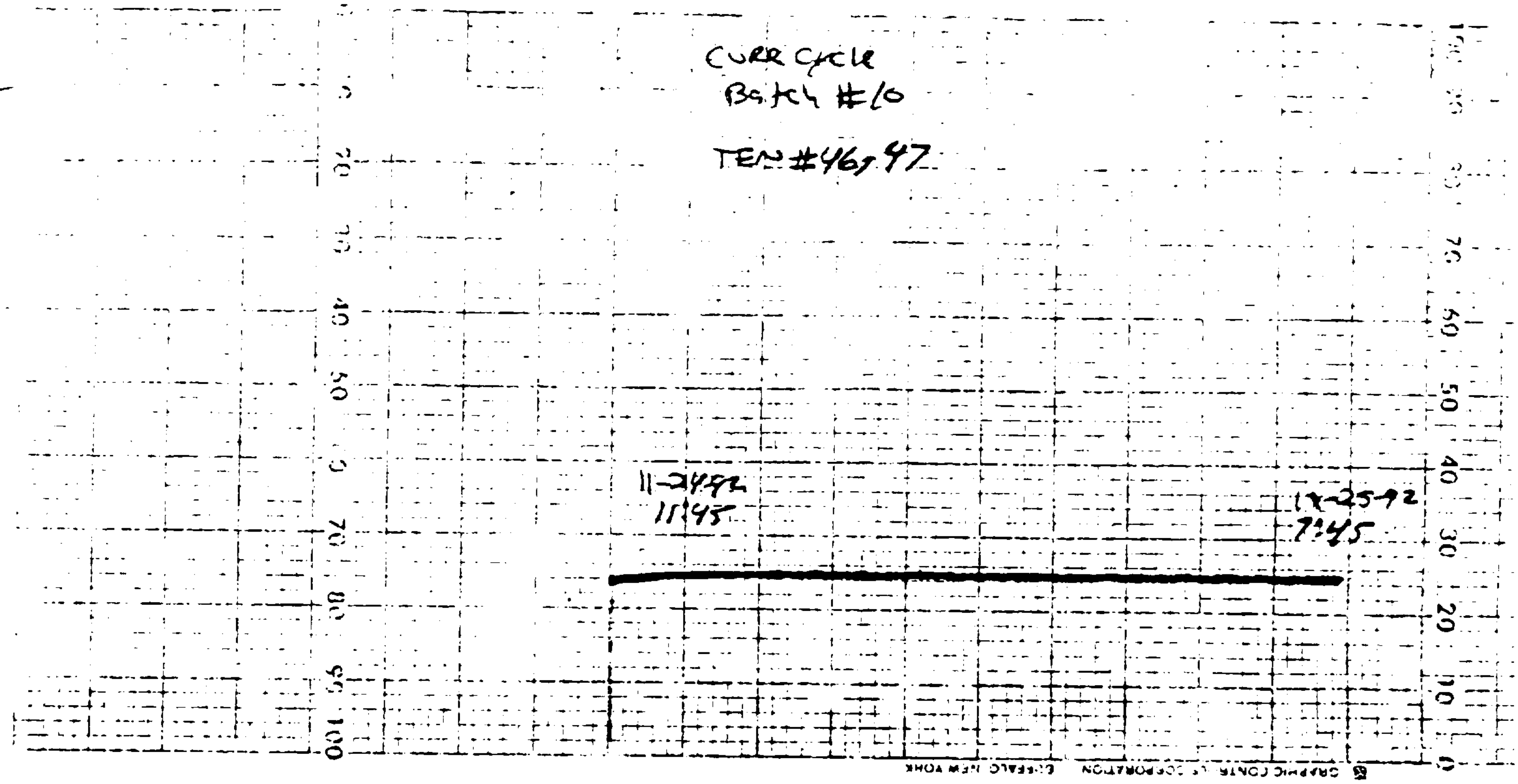

Cure Cycle
Batch #9
TEN # 31 → 34
11-19-92
15:30
11-20-92
8:0
1000°F/CM
1/2 cm/HR

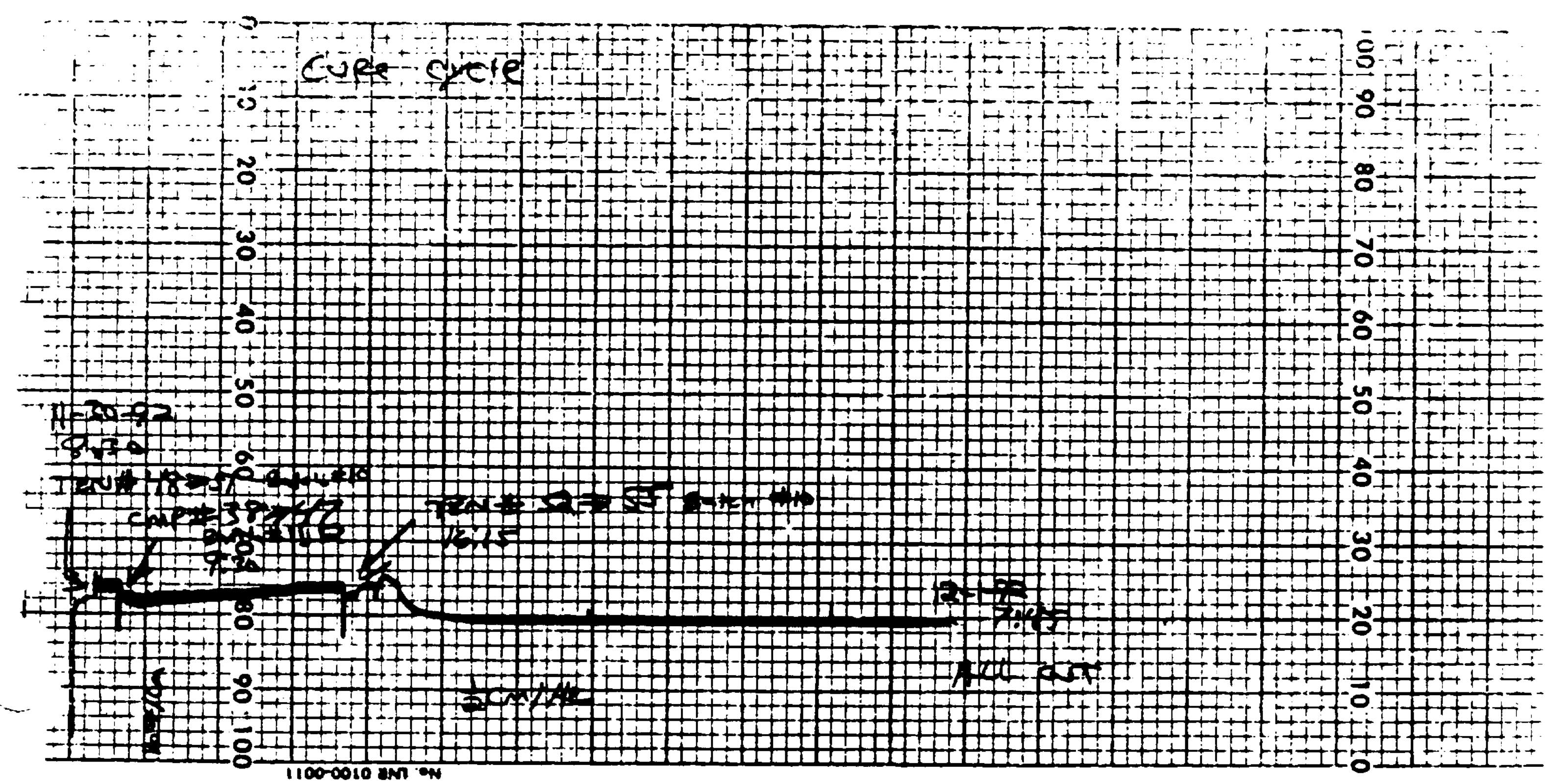

Cure Cycle
Batch #9
TEN # 35 → 37
OLD TEN # 1 → 3
11-20-92
8:20
1000°F/CM
GRAPHIC CONTROLS CORPORATION BUFFALO, NEW YORK

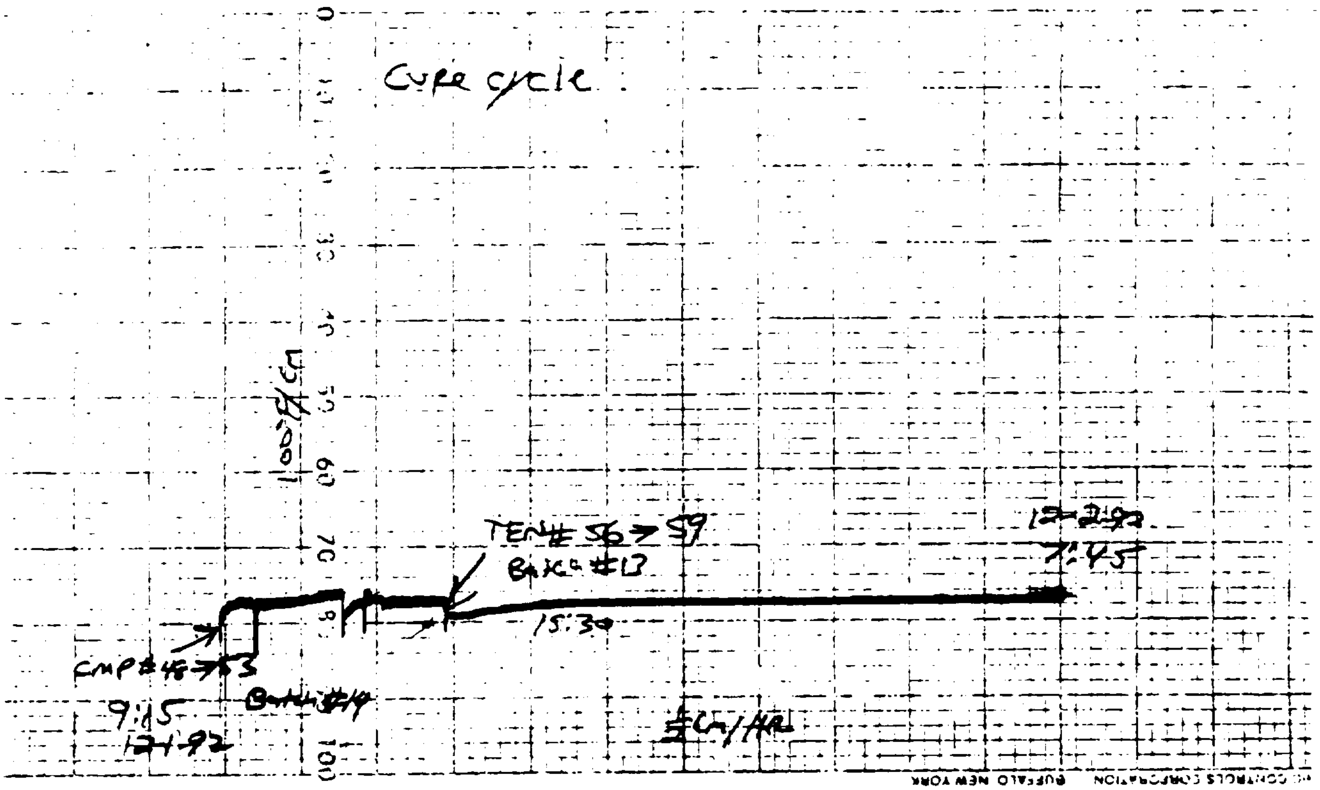

Cure cycle
Batch #9
OLD TEN #4→6
11-20-92
16:20
11-23-92
7:30
OUT

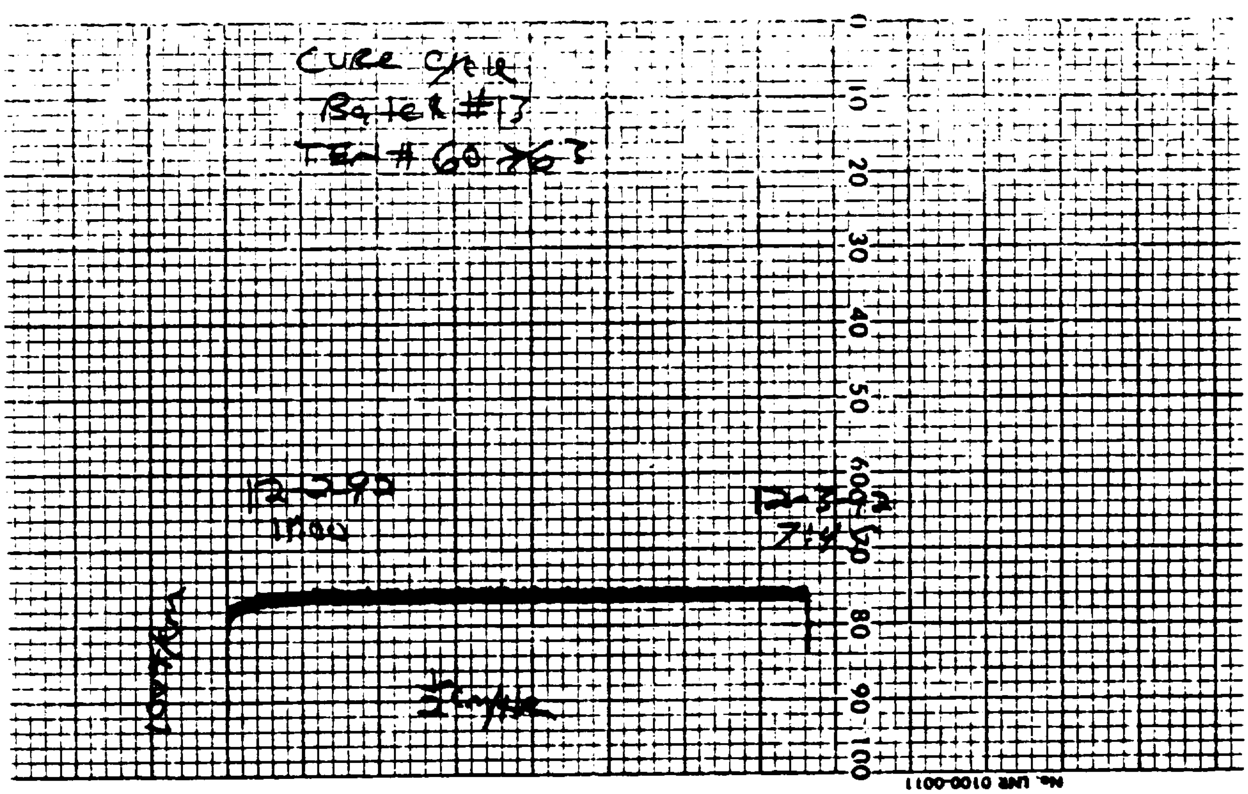

Cure cycle
Batch #9
OLD TEN #7→9
TEN # 38→41
11-23-92
9:00
0
10
20
40
50
60
70
GRAPHIC CONTROLS CORPORATION

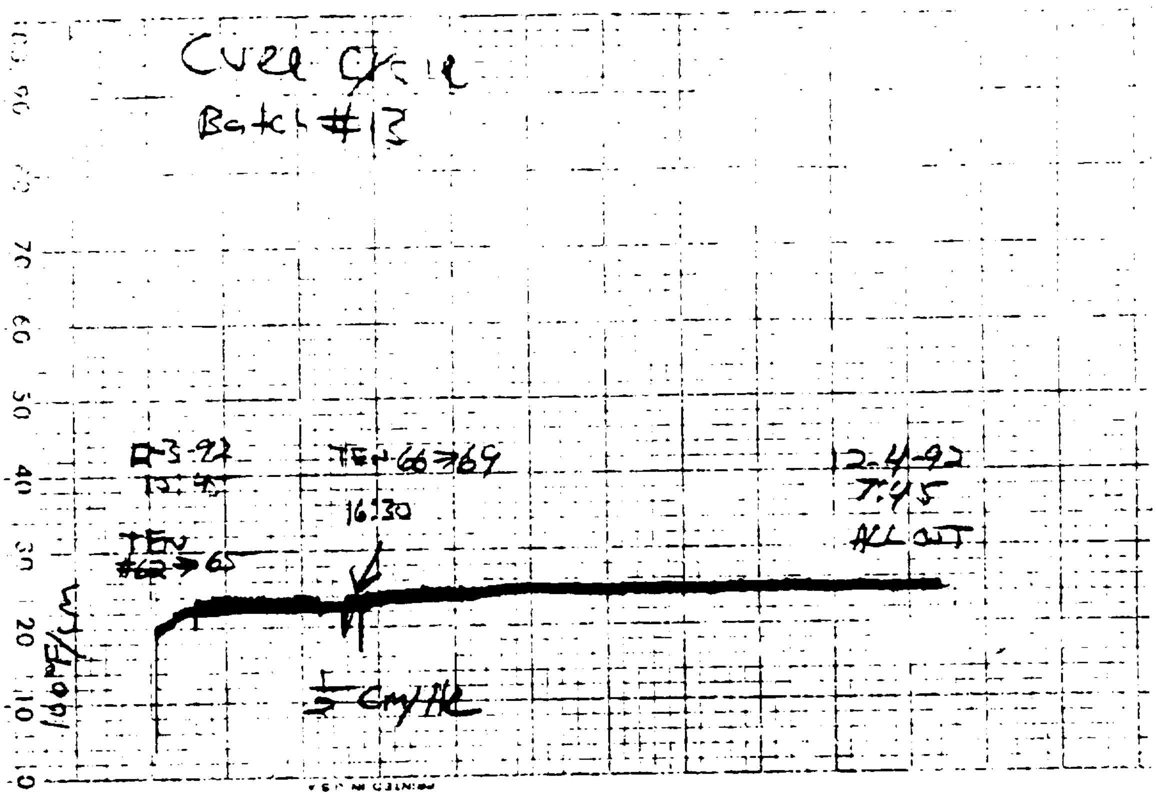

Cure cycle
0
10
20
30
40
50
60
70
80
90
100
11-23-92
11-24-92
7:45
No. LNB 0100-0011

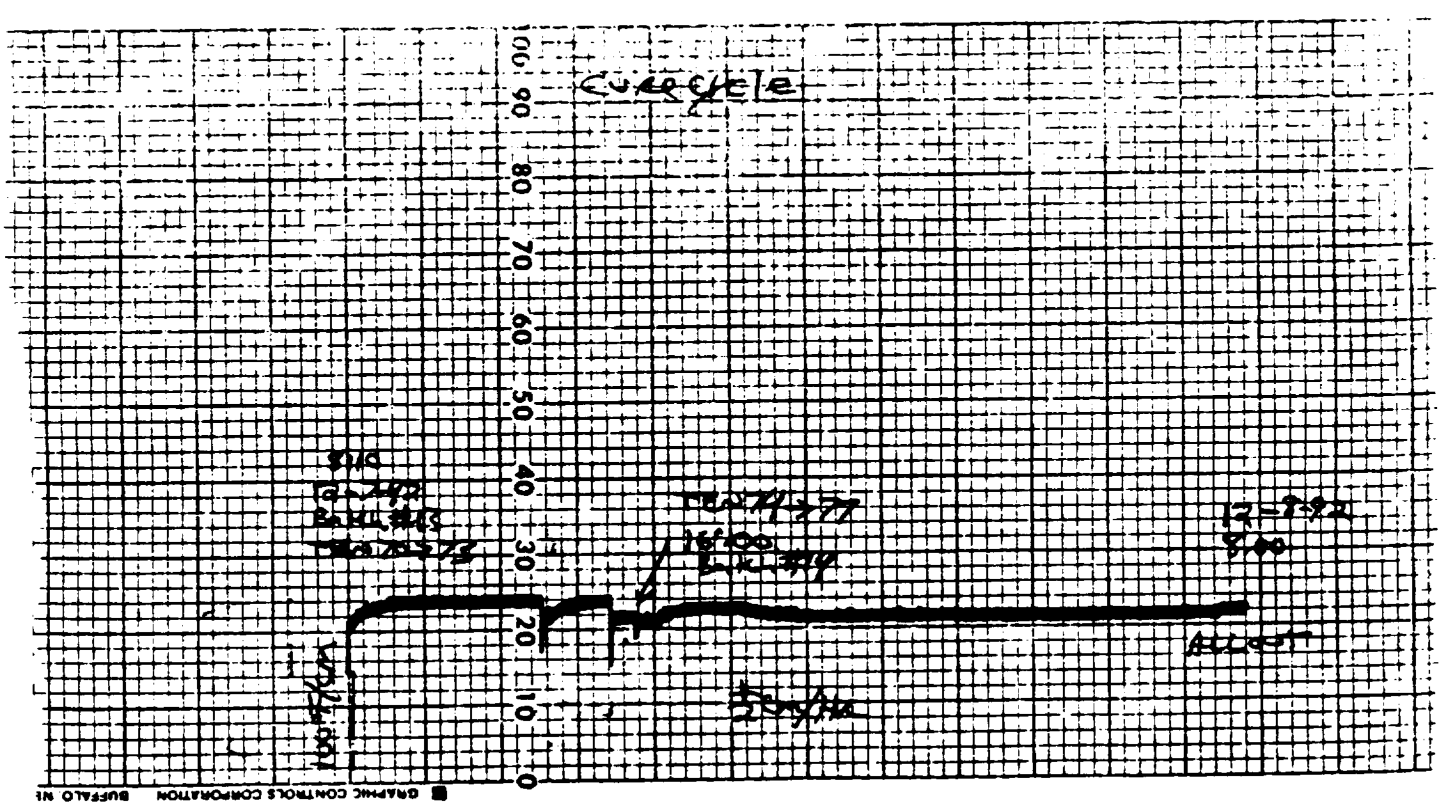

Cure Cycle
Batch #6
TEN #46, 47
11-24-92
11:45
11-25-92
7:45

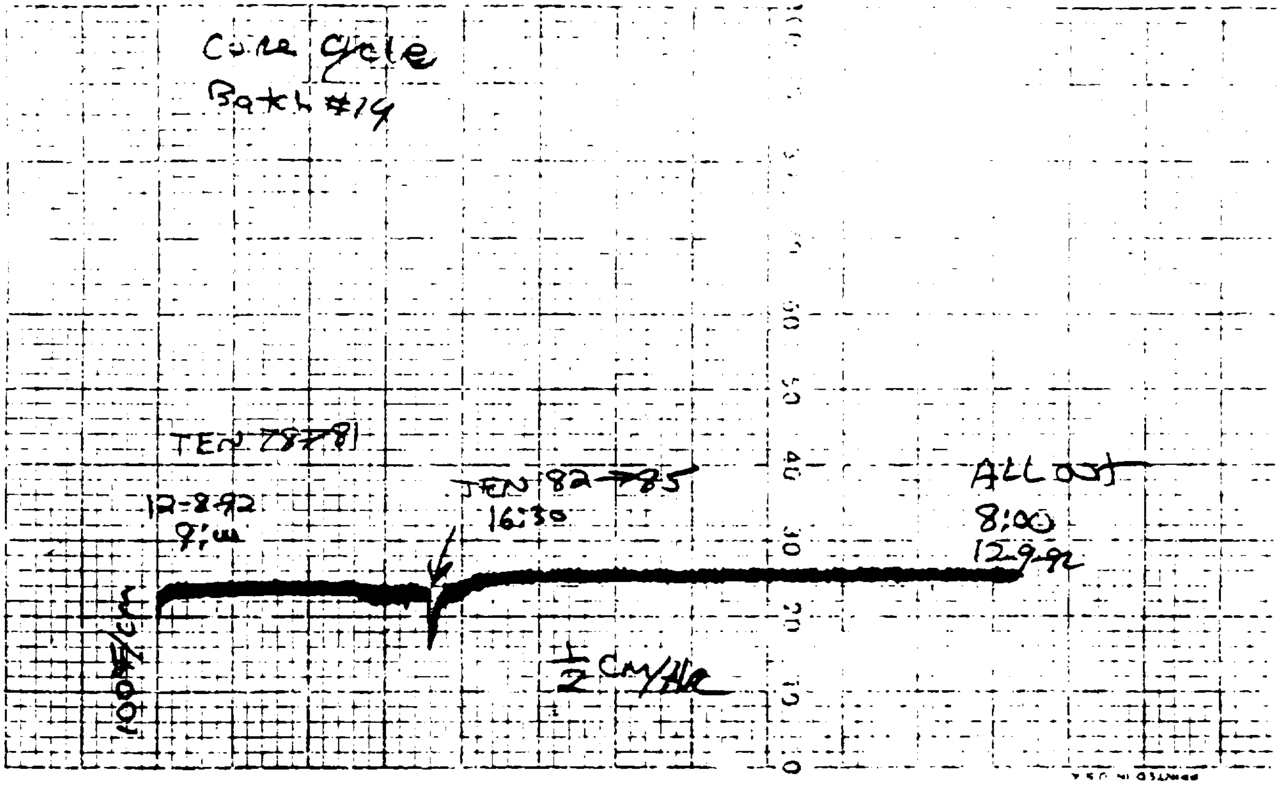

Cure cycle

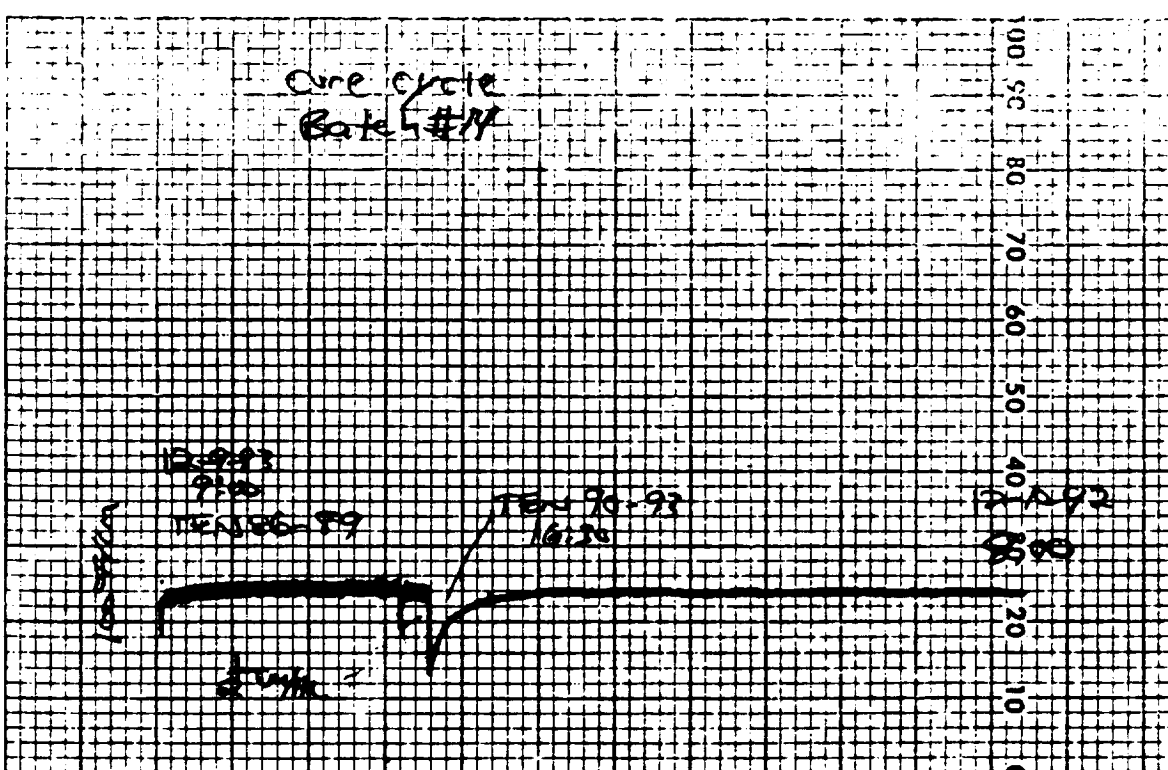

Cure cycle
TEM# 56 > 59
Batch #13
15:30
12-2-92
7:45
CMP# 48 > 53
9:15
12-1-92
Batch #14

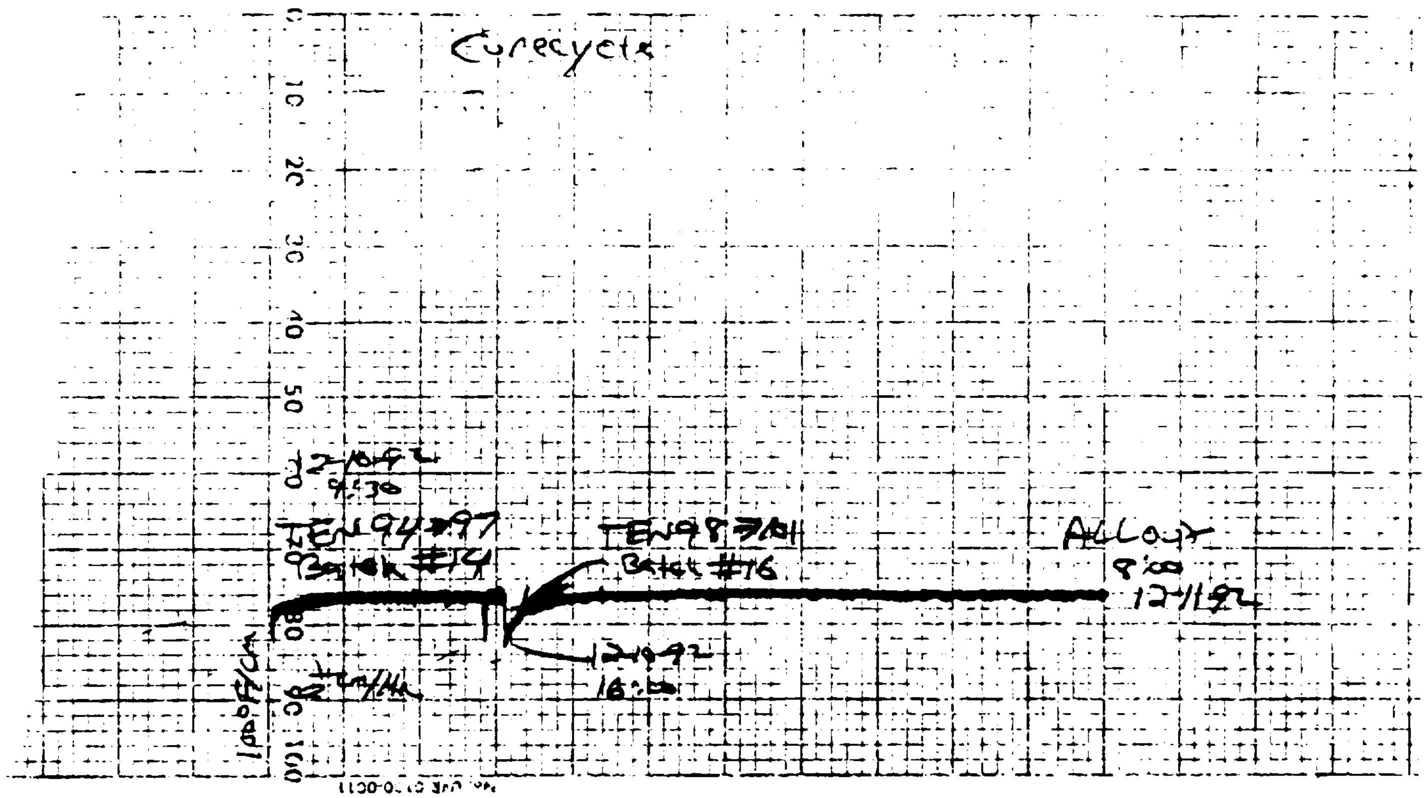

Cure cycle
Batch #13
TEM # 60 > 63
12-2-92
1100
12-3-92
7:4


Cure Cycle
Batch #13
Wt/Gal
Gm/Hr
ALL OUT
GRAPHIC CONTROLS CORPORATION BUFFALO NY

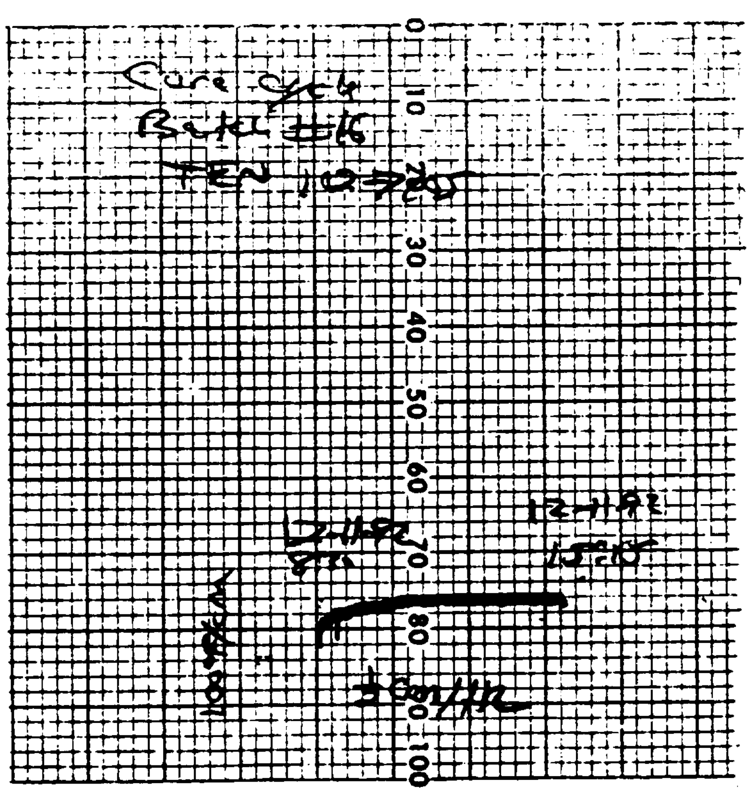

Cure Cycle
Wt/Gal
Gm/Hr
ALL OUT
GRAPHIC CONTROLS CORPORATION BUFFALO NY


Cure Cycle
Batch #14
TEN 78→81
12-8-92
9:00
TEN 82→85
16:30
ALL OUT
8:00
12-9-92
100#/cm
½ cm/hr

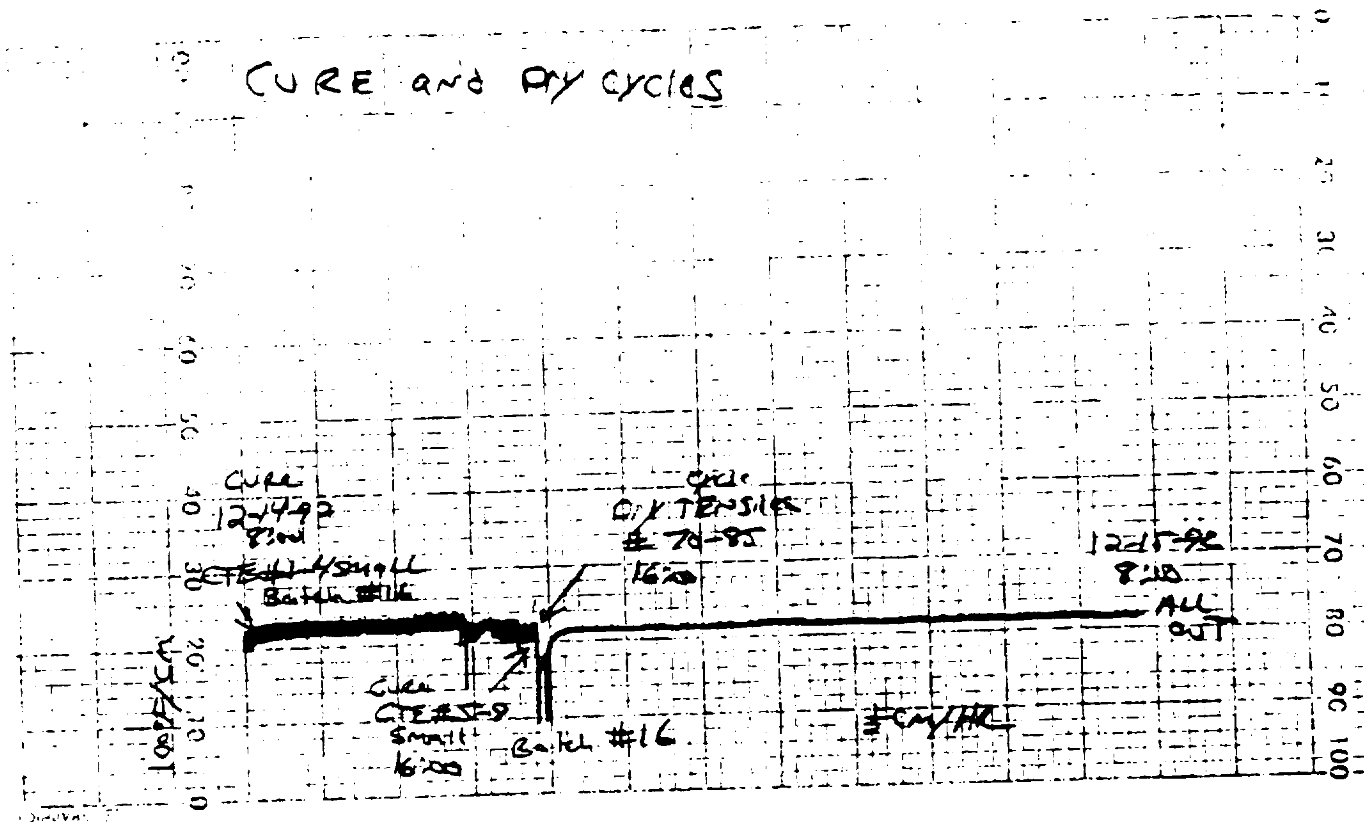

Cure Cycle
Batch #14
TEN 86-89
TEN 90-93
16:30

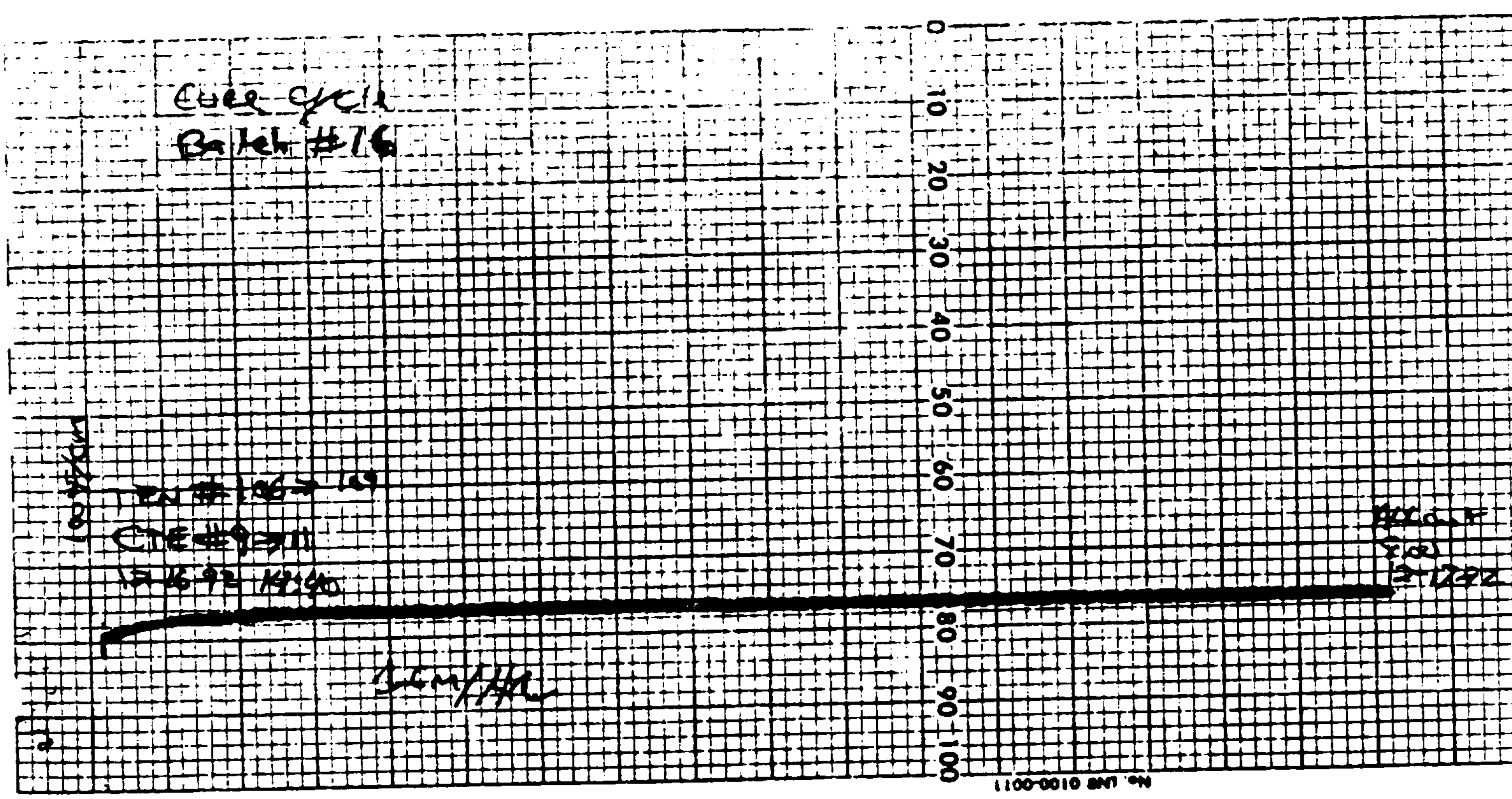


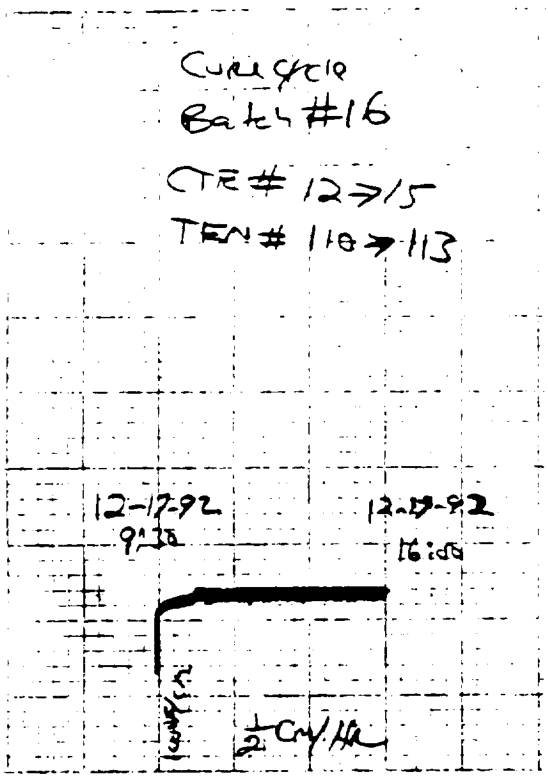
Curecycle
12-10-92
9:30
TEN 94→97
Batch #14
TEN 98→101
Batch #16
Alloy
9:00
12-11-92
12-10-92
16:00

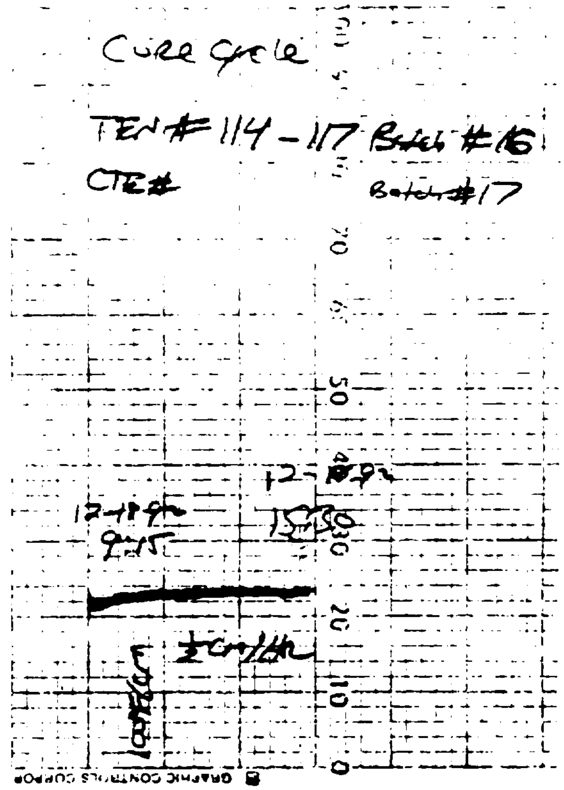


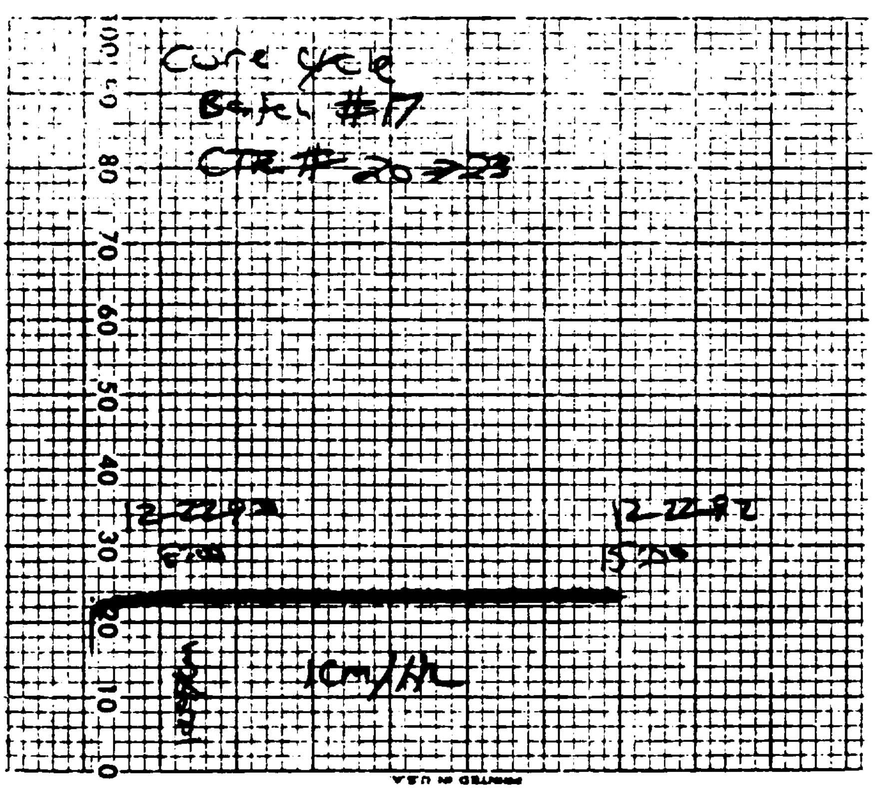
Cure cycle
Batch #16
TEN 102→105
12-11-92
8:00
12-11-92
15:15

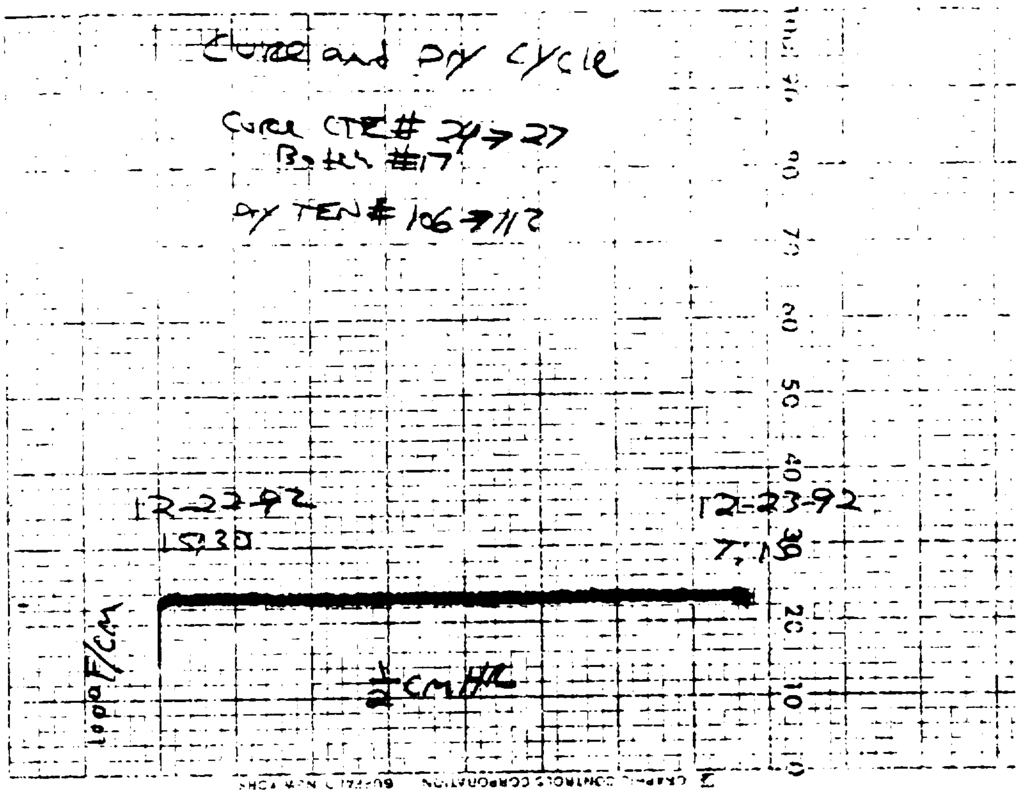

CURE and Dry cycles
Cure
12-14-92
8:00
Cycle
Dry TENSILES
70-85
16:00
12-15-92
8:10
ALL
OUT
Batch #16
Cure
CTE #5-8
Small
16:00
Batch #16

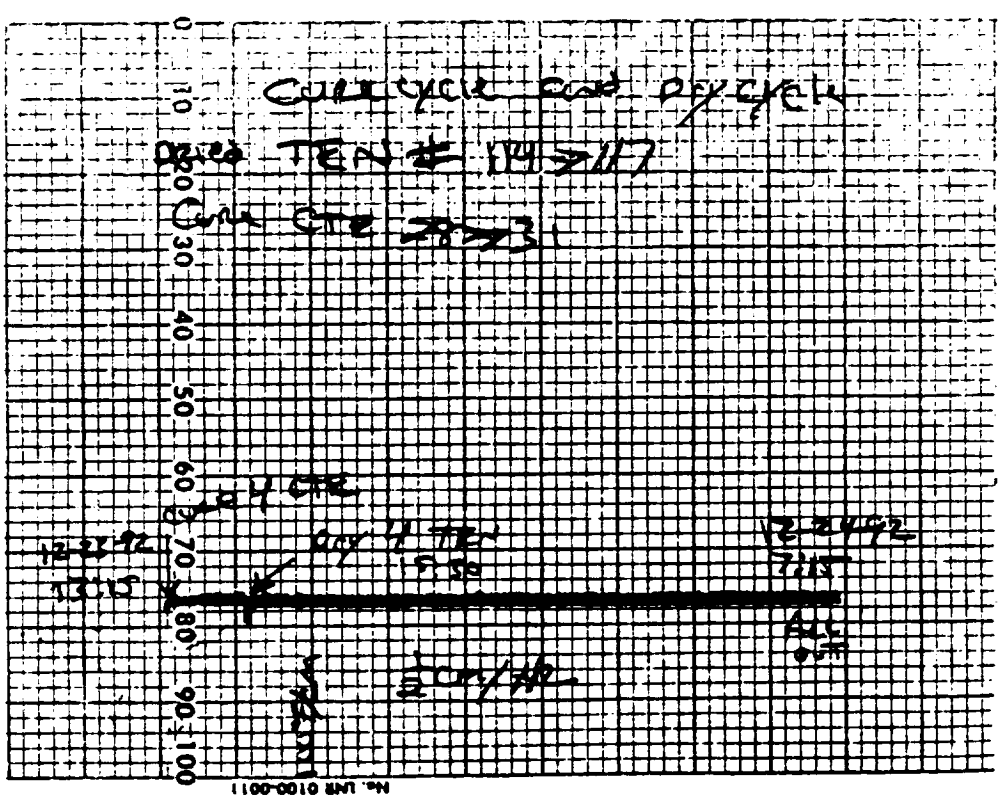

Cure cycle
Batch #16
CTE #9-11
12-16-92
0 10 20 30 40 50 60 70 80 90 100

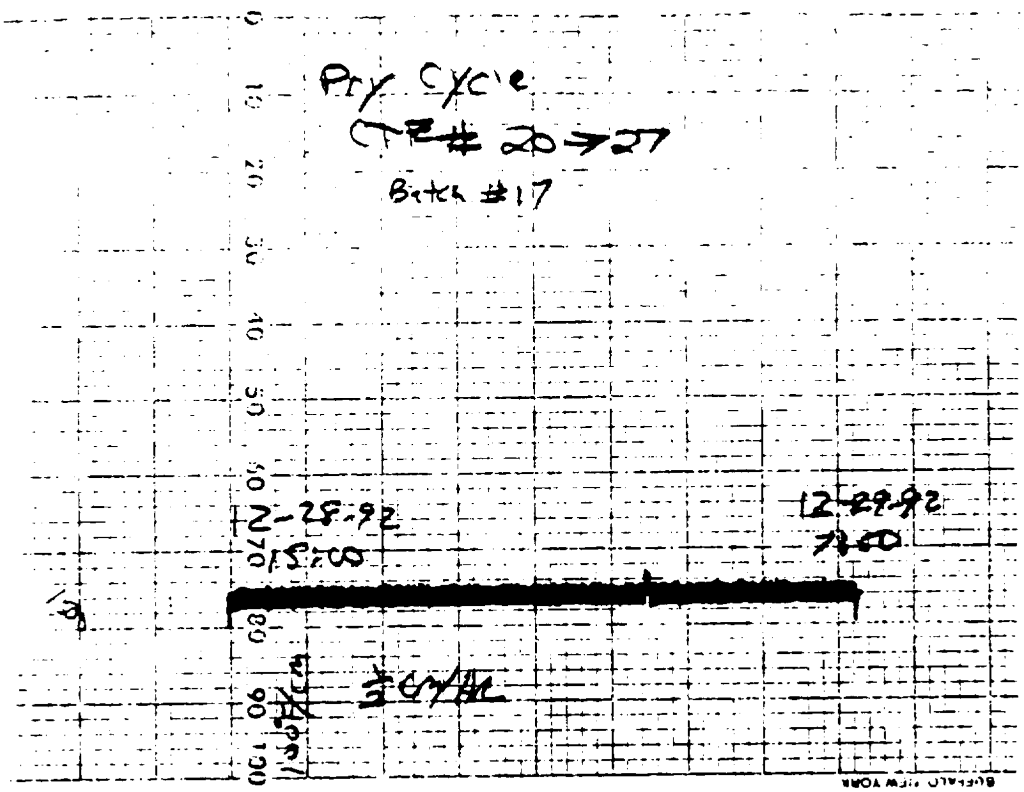

Cure cycle
Batch #16
CTE # 12→15
TEN # 110→113
12-17-92
9:30
12-17-92
16:00
½ Cm/Hr

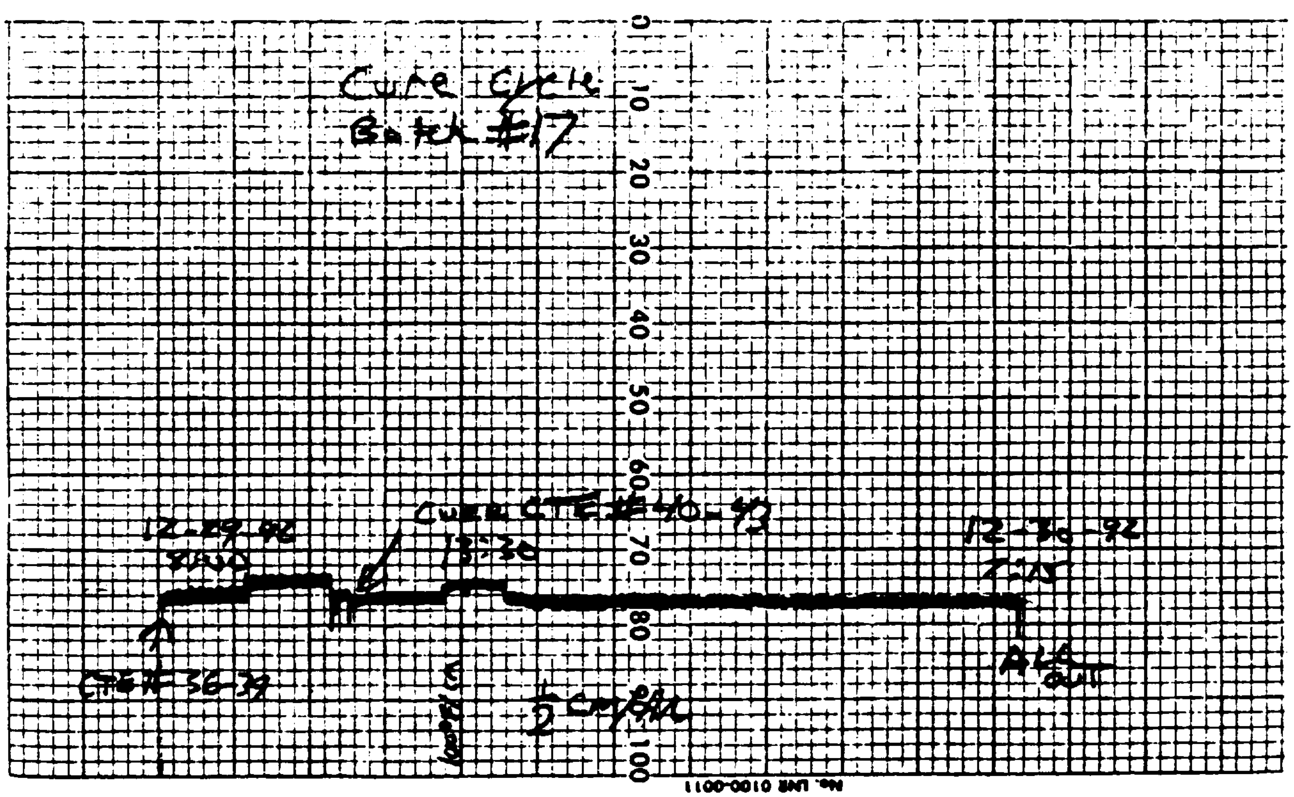

Cure cycle
TEN # 114 - 117 Batch #16
CTE #
Batch #17
12-18-92
9:15
½ Cm/Hr


Cure cycle
Batch #17
CTE # 20→23
12-22-92
12-22-92
1 Cm/Hr

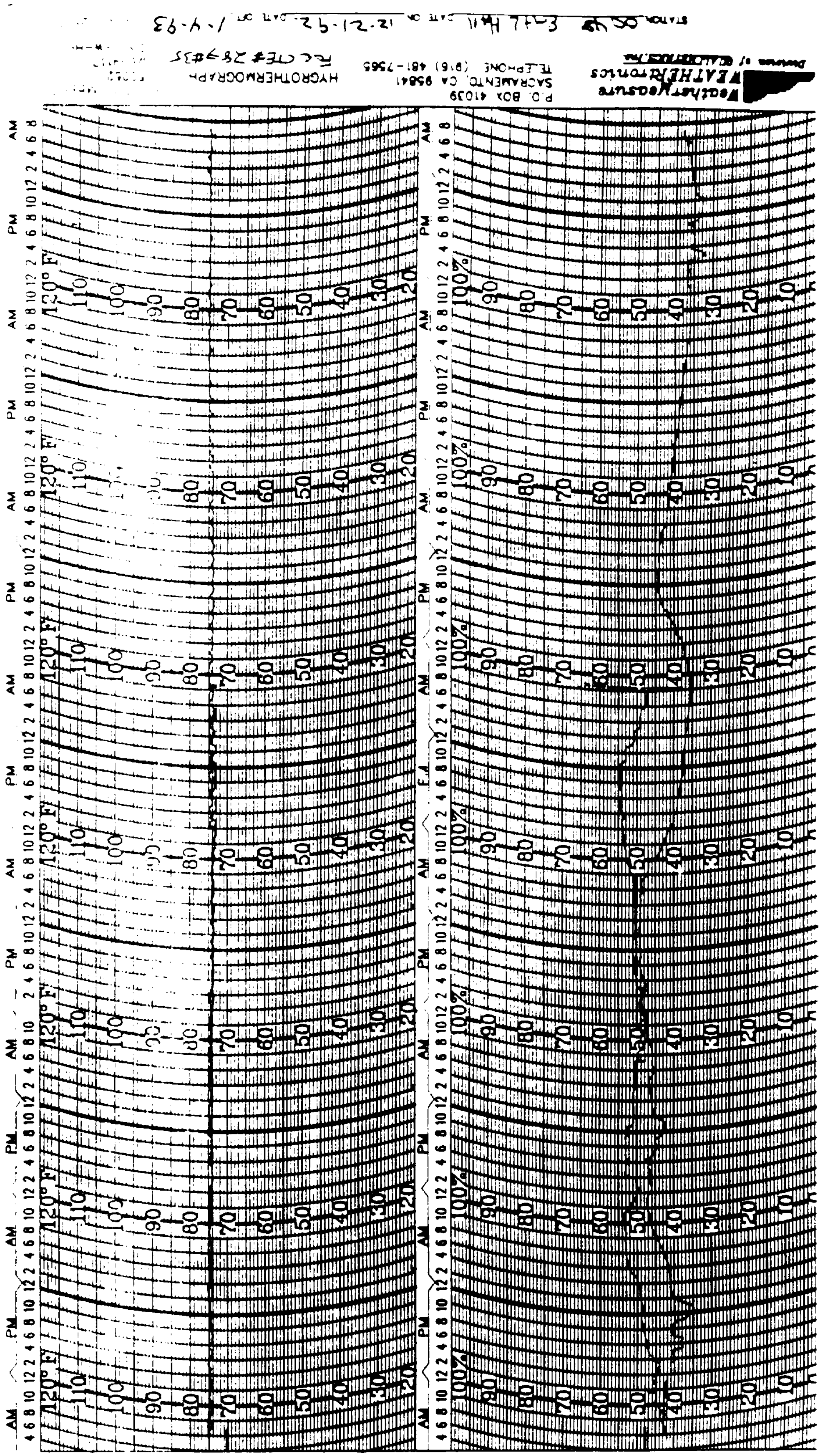

Cure and Dry cycle
Cure CTE# 24→27
Batch #17
Dry TEN# 106→112
12-22-92
15:30
12-23-92
7:15
100°F/CM
½ CM/HR


Cure cycle and Dry cycle
TEN # 114→117
Cure CTE 28→31
12-23-92
13:15
15:50
12-24-92
7:15
½ CM/HR


Dry Cycle
CTE# 20→27
Batch #17
12-28-92
15:00
12-29-92
7:00
½ cm/hr

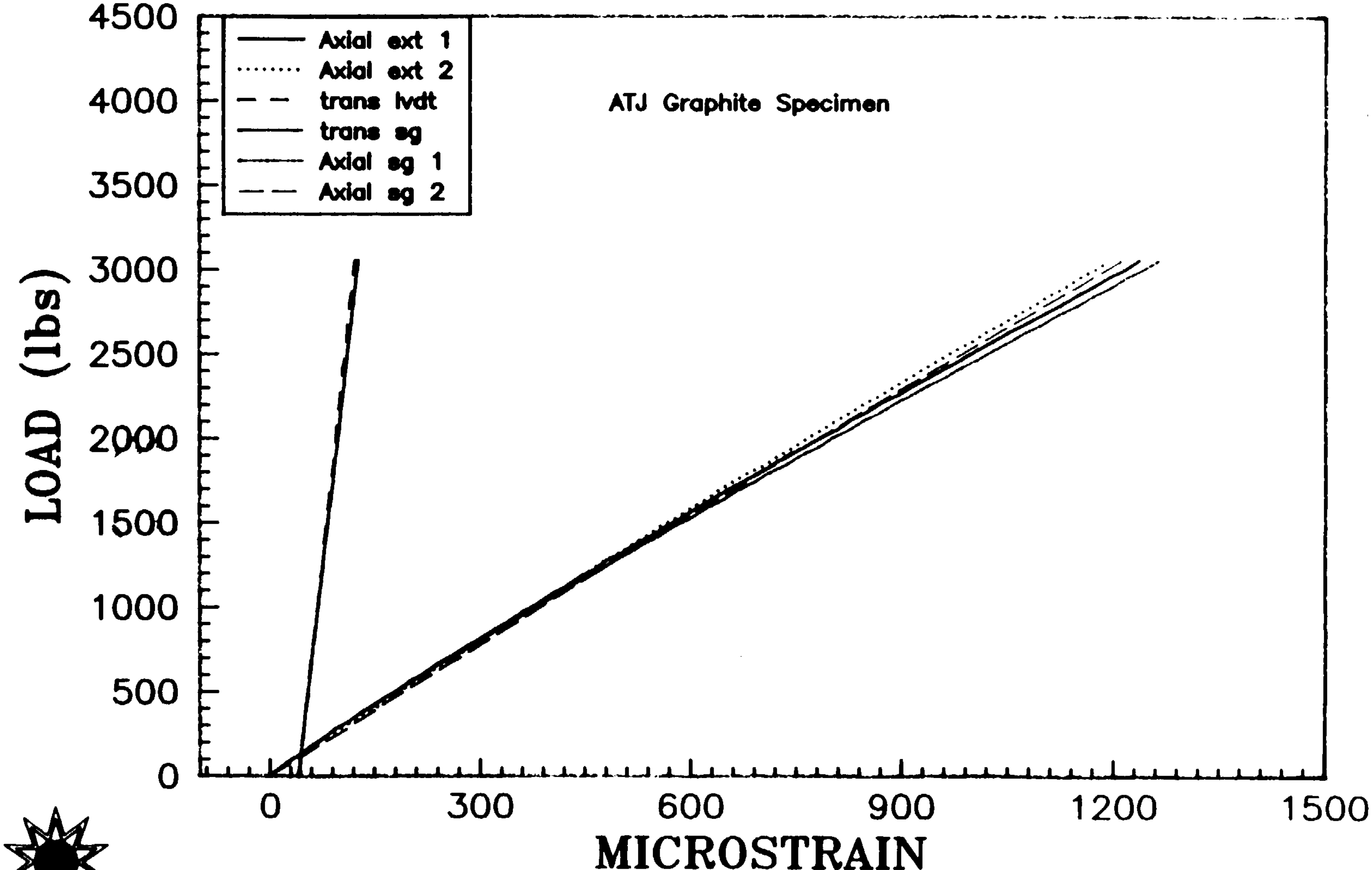

Cure Cycle
Batch #17
12-29-92
8:00
CURE CTE# 40-47
15:30
12-30-92
7:15
CTE# 36-39
½ cm/hr
ALL OUT

LABORATORY AMBIENT HUMIDITY STRIP CHARTS


Weathermeasure
WEATHERtronics
P.O. BOX 41039
SACRAMENTO, CA 95841
TELEPHONE (916) 481-7565
HYGROTHERMOGRAPH

TENSILE AND COMPRESSIVE STRAIN MEASUREMENT QUALIFICATIONS

PVA/MB SOLUBLE CORE COMPRESSION TEST
GRAPHITE QUALIFICATION



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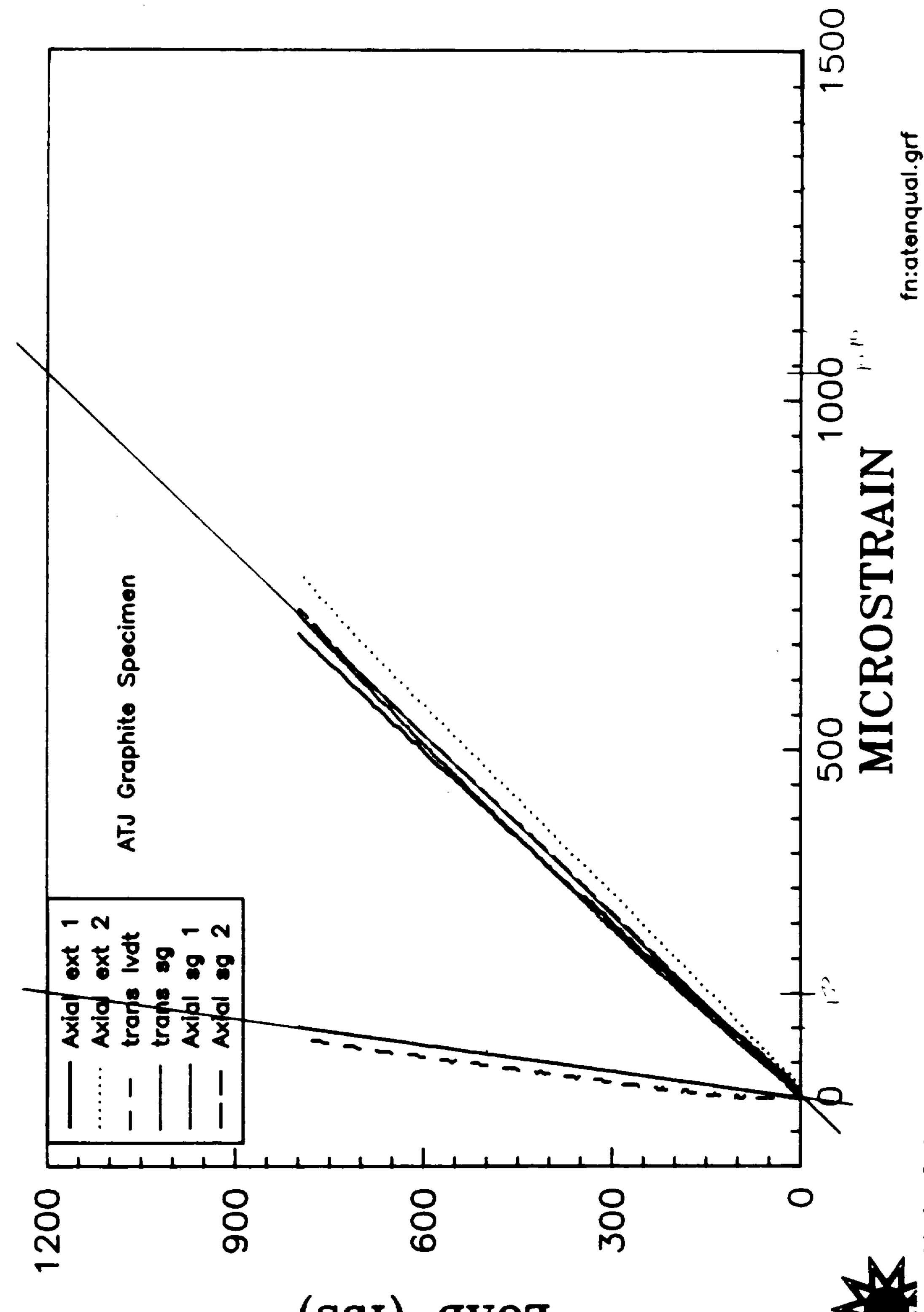
fn:acmpqual.grf

PVA/MB SOLUBLE CORE TENSION TEST
GRAPHITE QUALIFICATION



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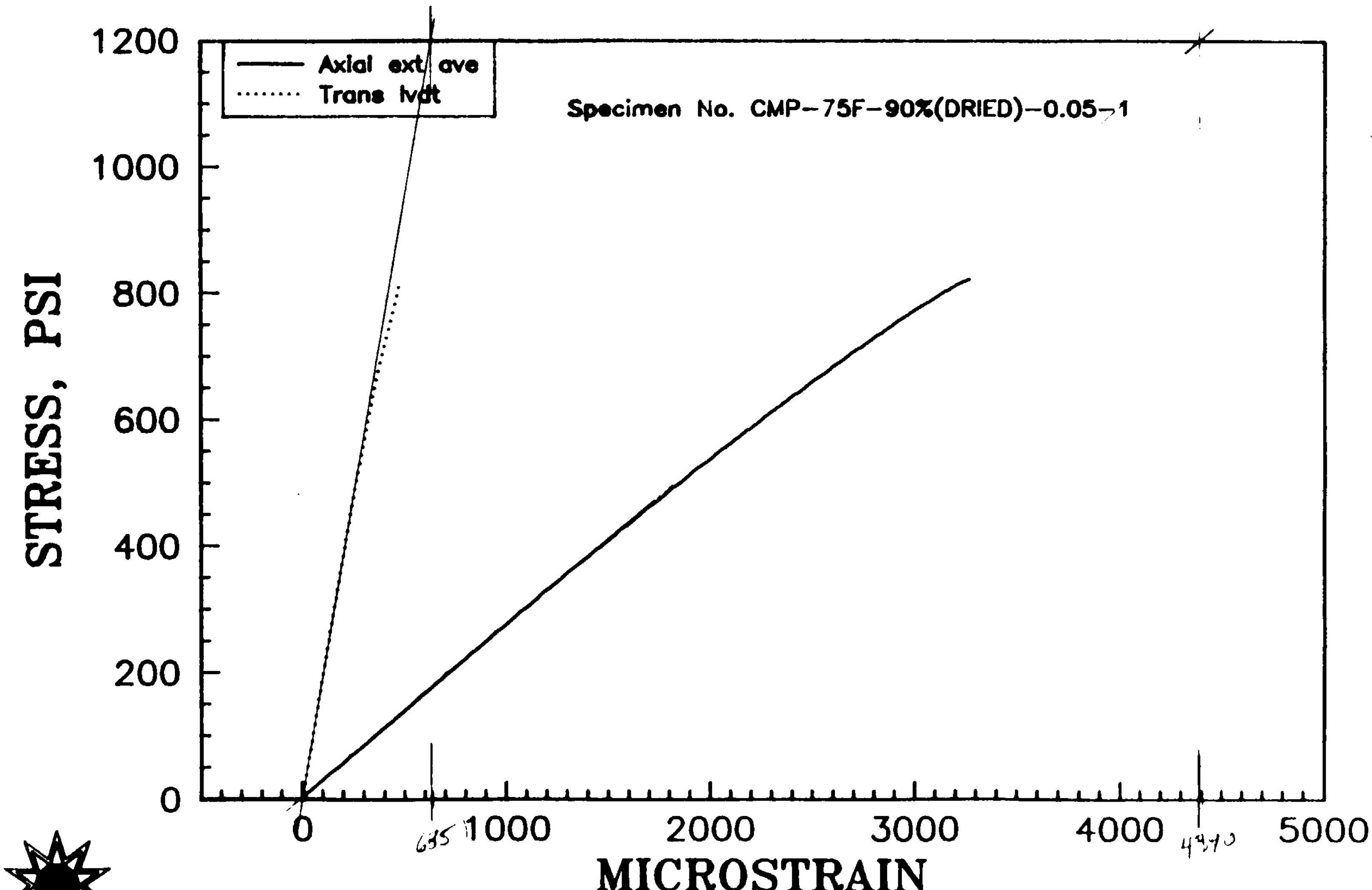
INDIVIDUAL TENSILE AND COMPRESSIVE STRESS VS STRAIN PLOTS
(RAW DATA)

PVA/MB SOLUBLE CORE COMPRESSION TEST
AGED AT 90°F, 90% RH; THEN DRIED AT 180°F



fn:acmp-1.grf

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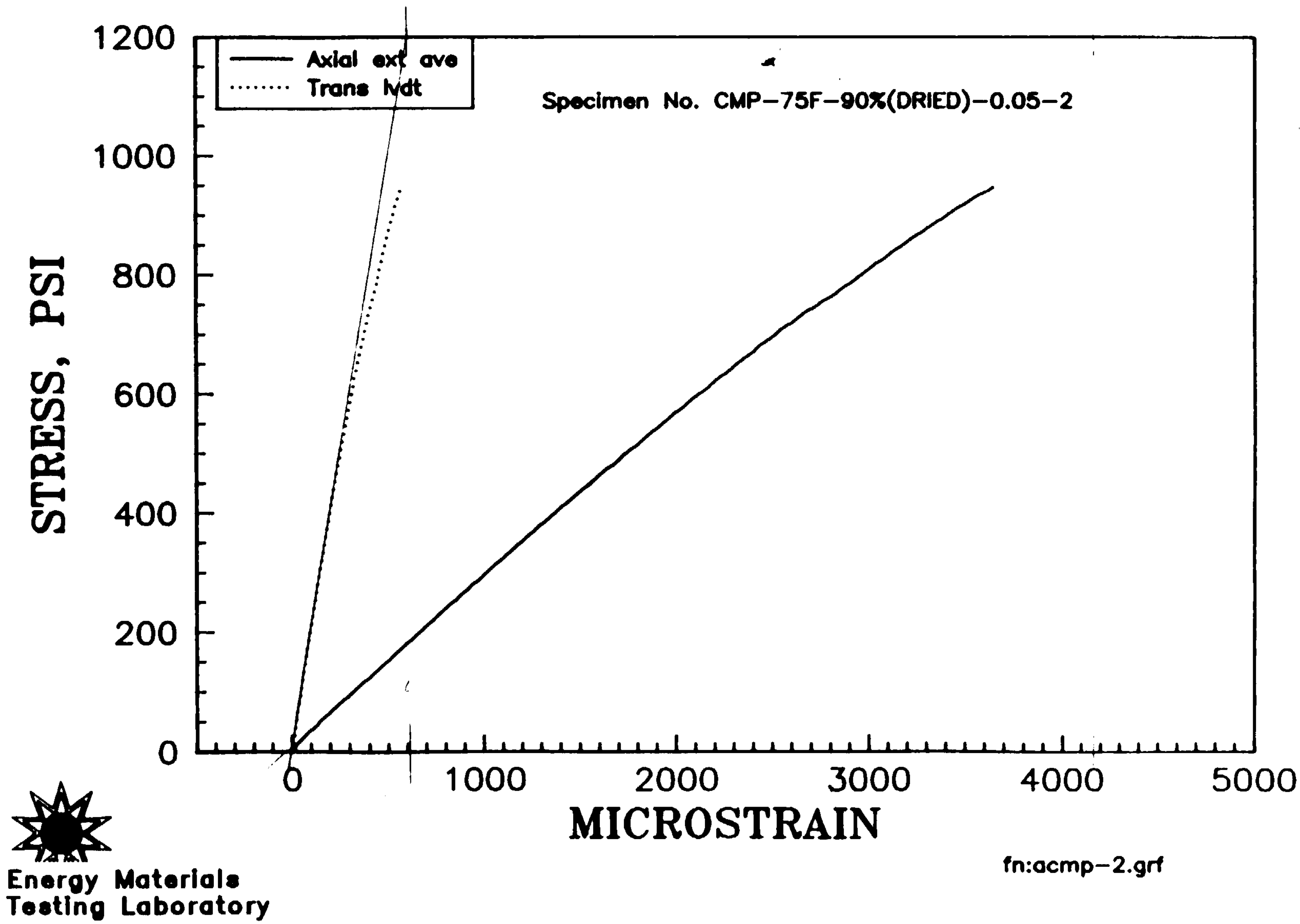
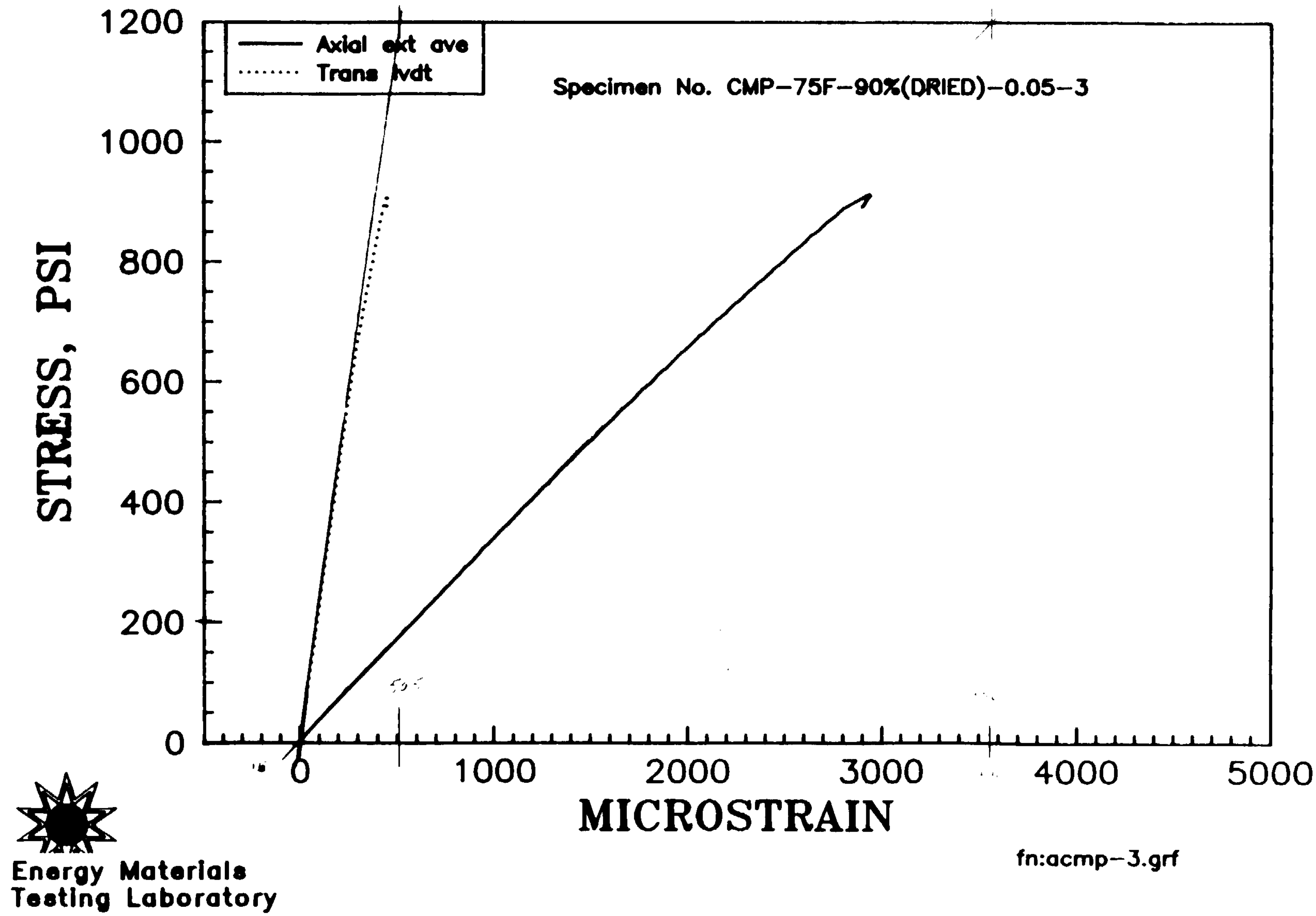
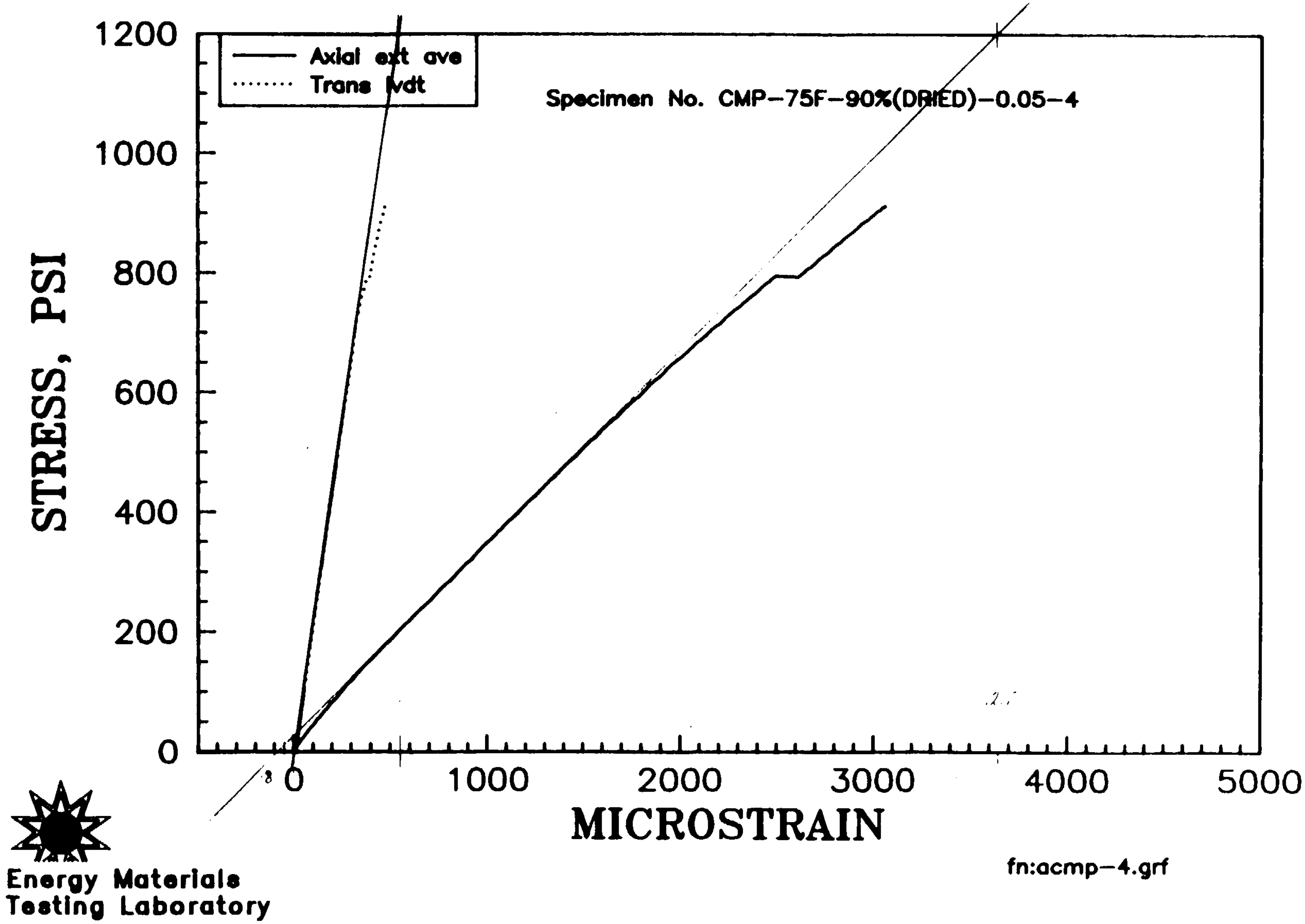
PVA/MB SOLUBLE CORE COMPRESSION TEST AGED AT 90°F, 90% RH; THEN DRIED AT 180°F



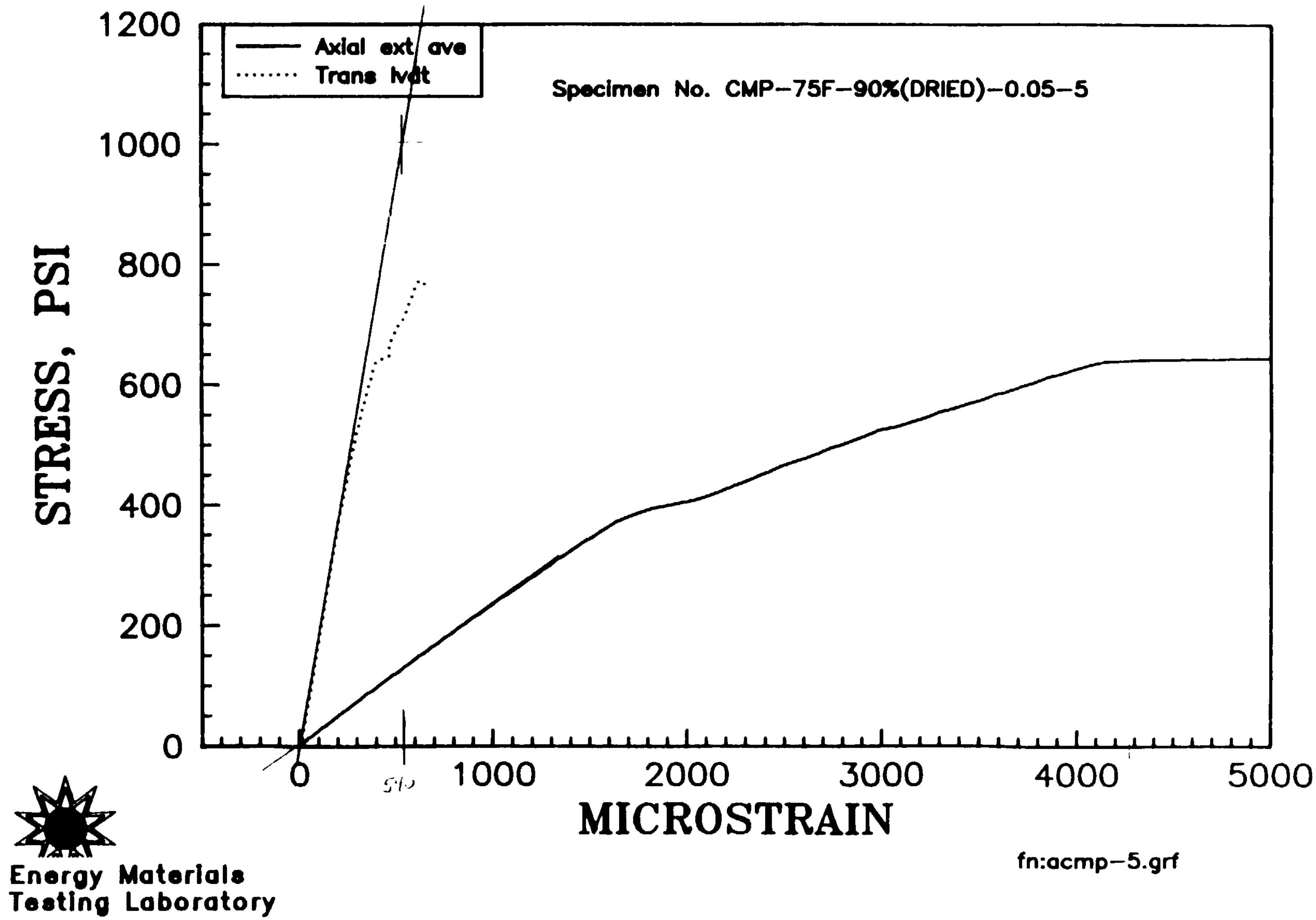
PVA/MB SOLUBLE CORE COMPRESSION TEST AGED AT 90°F, 90% RH; THEN DRIED AT 180°F



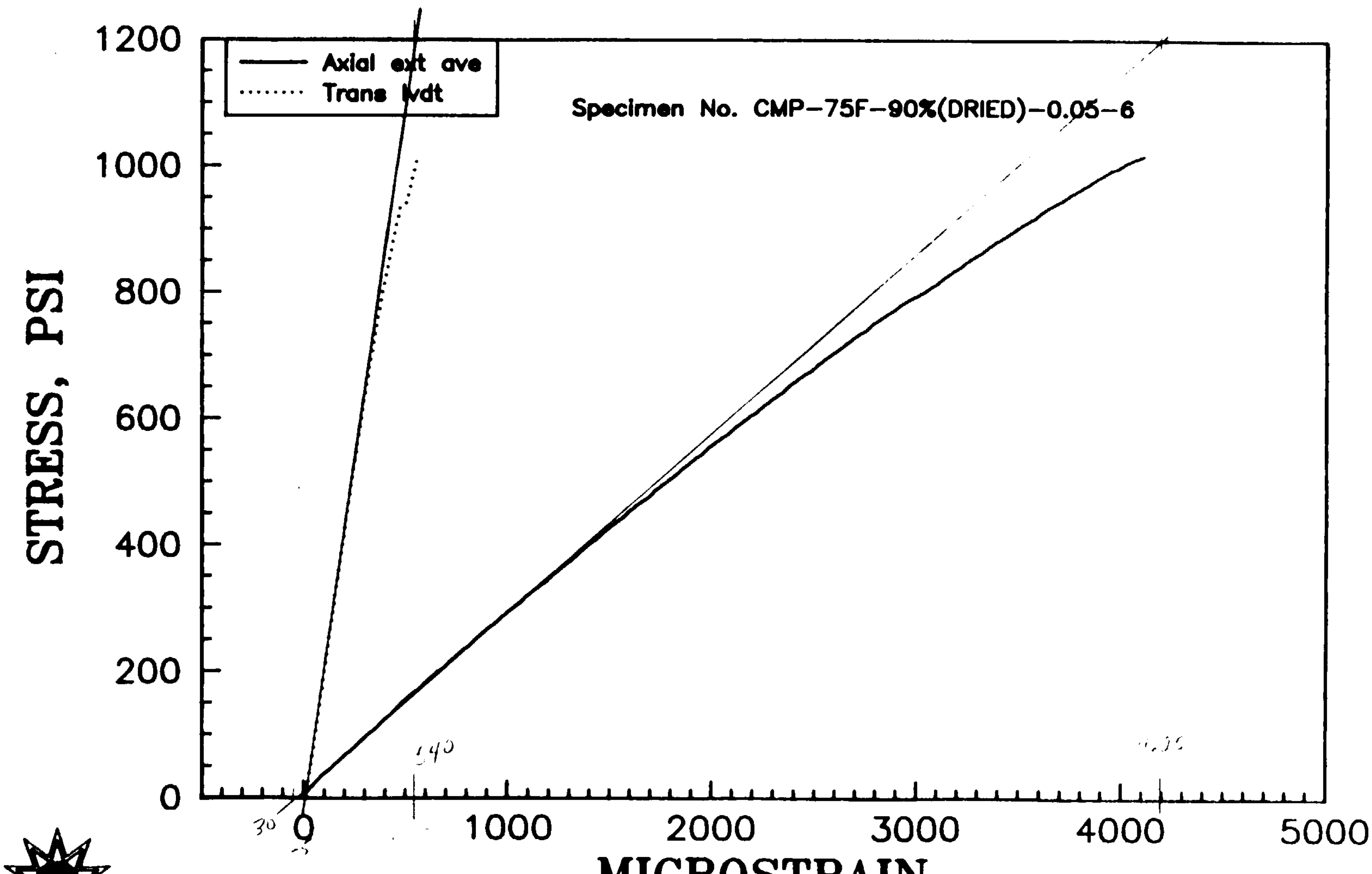
PVA/MB SOLUBLE CORE COMPRESSION TEST AGED AT 90°F, 90% RH; THEN DRIED AT 180°F



PVA/MB SOLUBLE CORE COMPRESSION TEST AGED AT 90°F, 90% RH; THEN DRIED AT 180°F



PVA/MB SOLUBLE CORE COMPRESSION TEST
AGED AT 90°F, 90% RH; THEN DRIED AT 180°F



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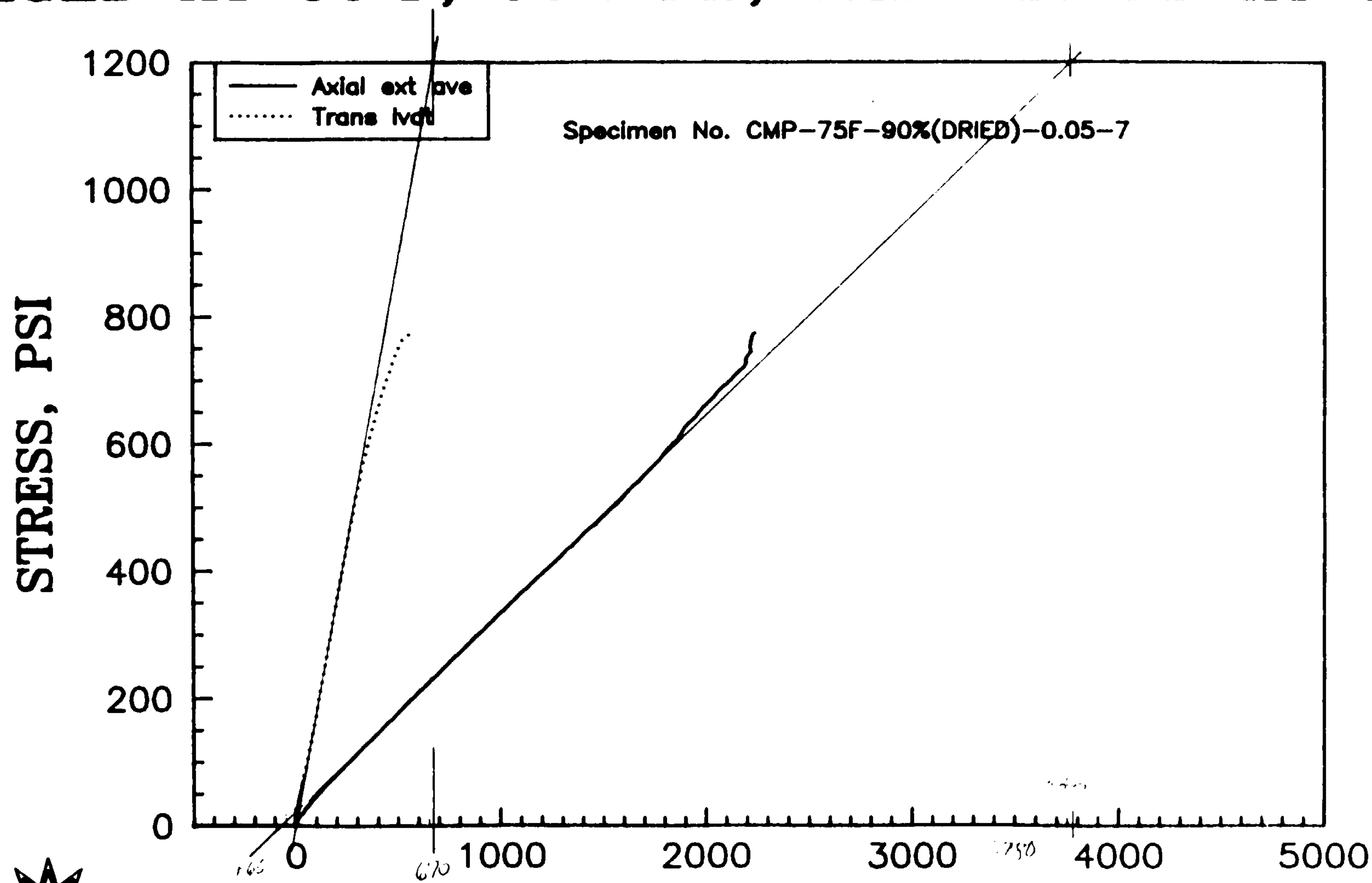
PVA/MB SOLUBLE CORE COMPRESSION TEST
AGED AT 90°F, 90% RH; THEN DRIED AT 180°F



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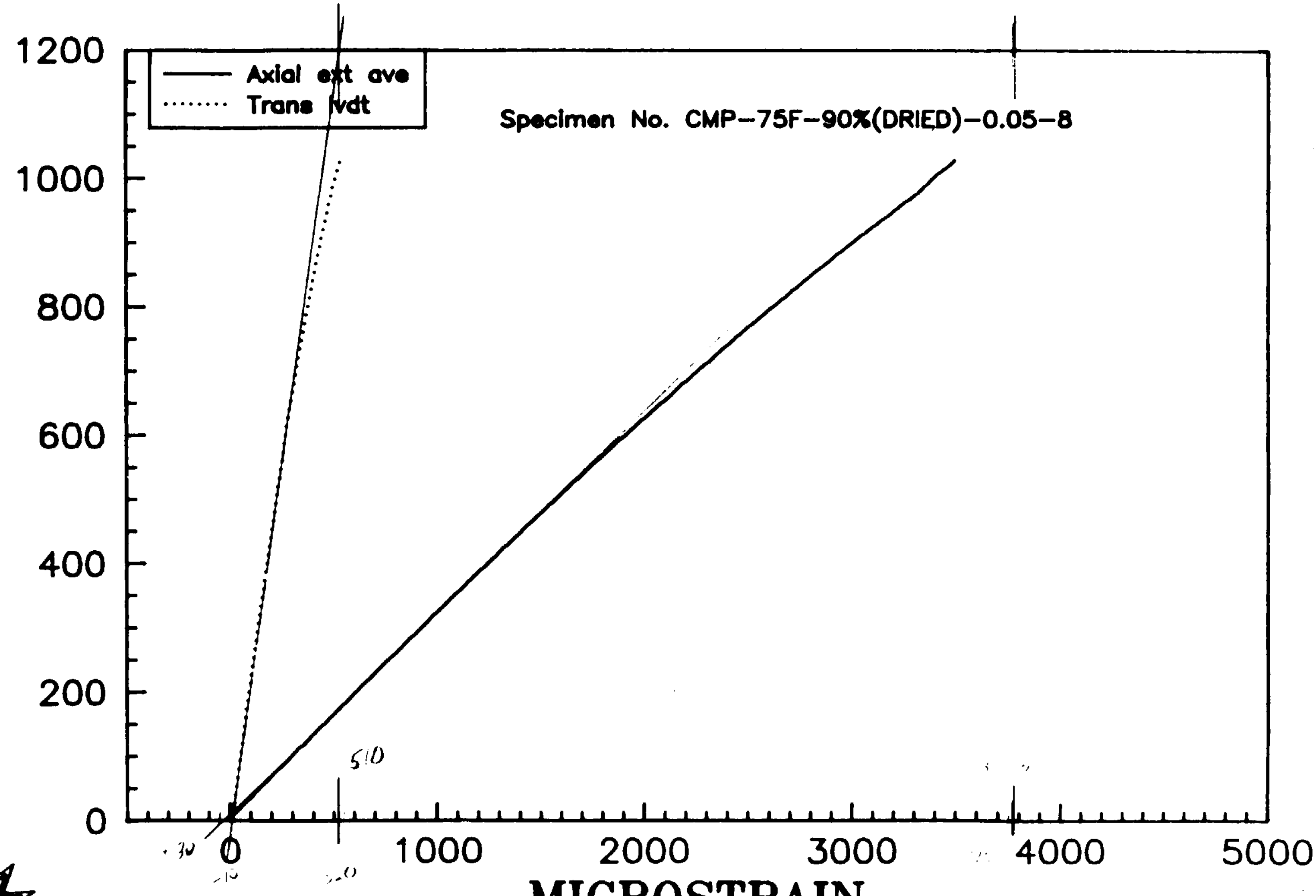
fn:acmp-7.grf

PVA/MB SOLUBLE CORE COMPRESSION TEST
AGED AT 90°F, 90% RH; THEN DRIED AT 180°F



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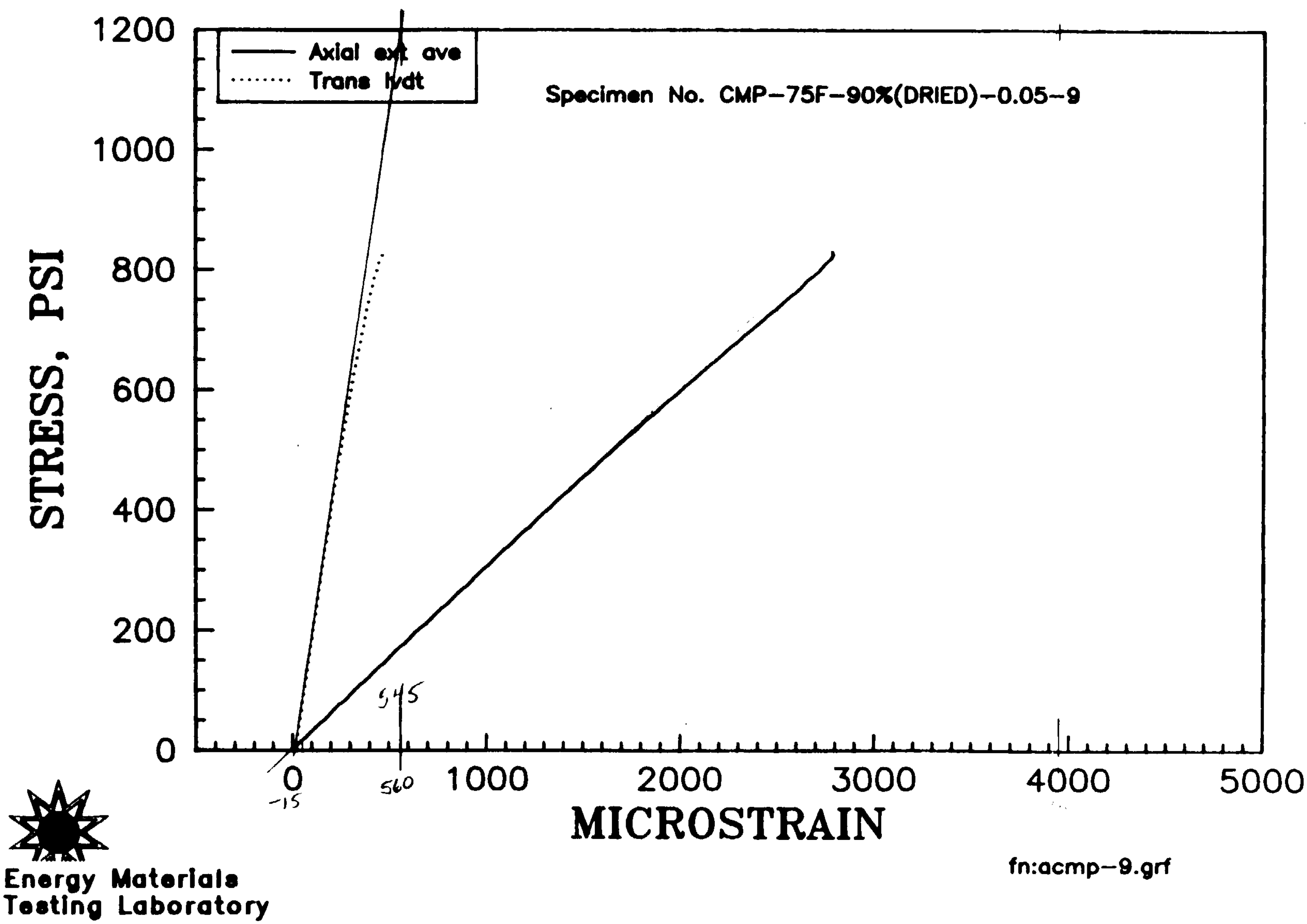
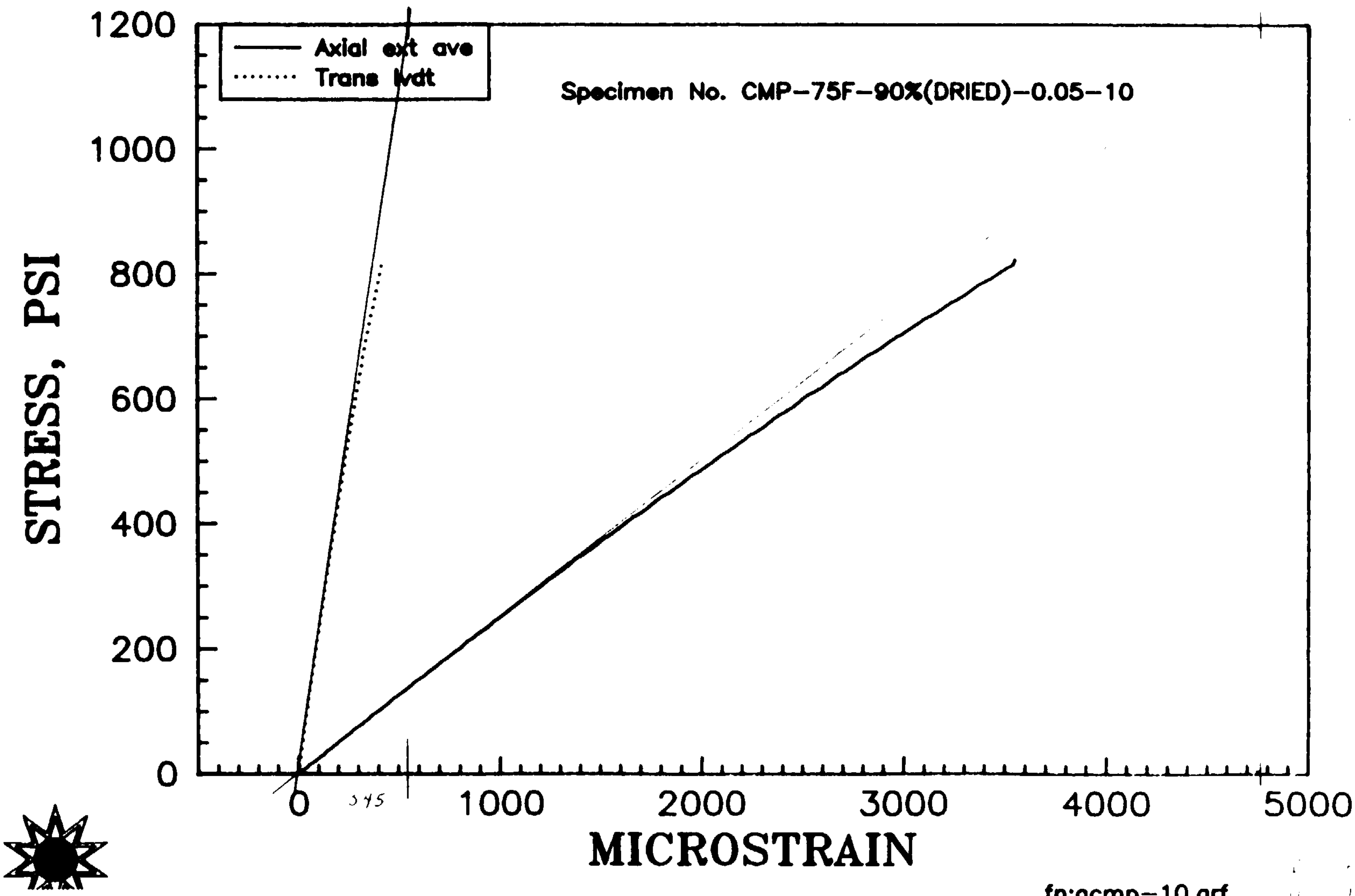
PVA/MB SOLUBLE CORE COMPRESSION TEST
AGED AT 90°F, 90% RH; THEN DRIED AT 180°F



PVA/MB SOLUBLE CORE COMPRESSION TEST AGED AT 90°F, 90% RH; THEN DRIED AT 180°F



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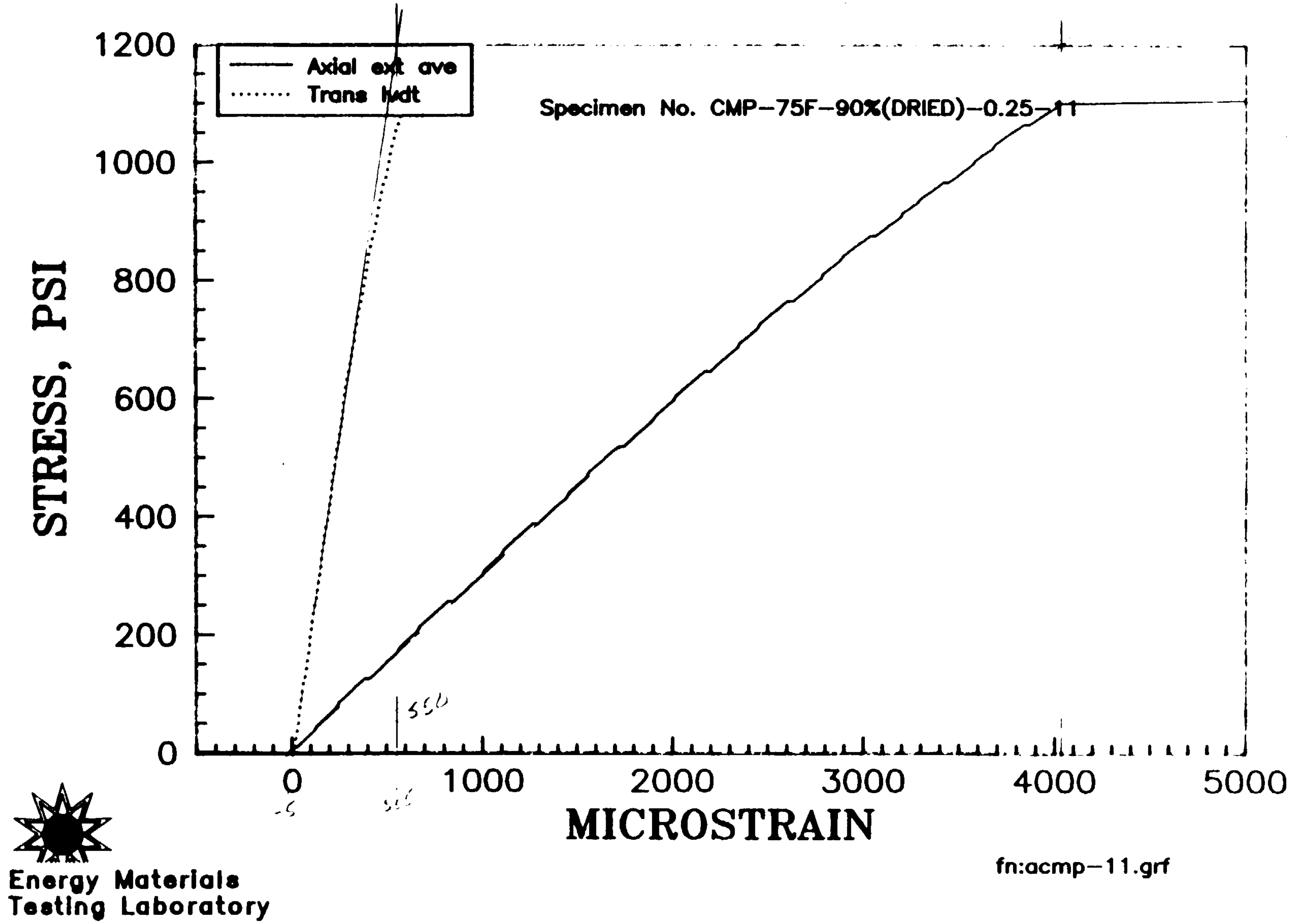
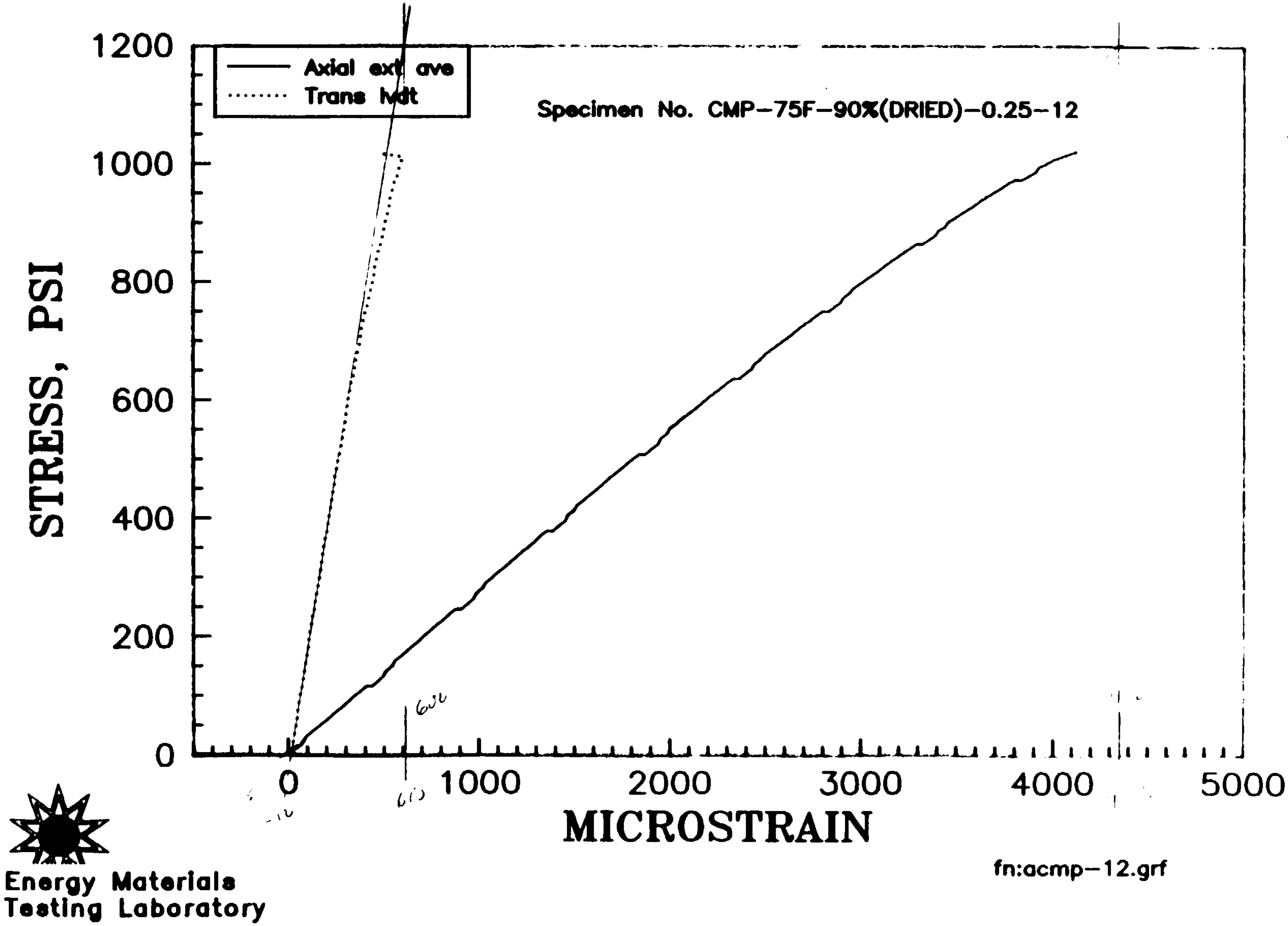
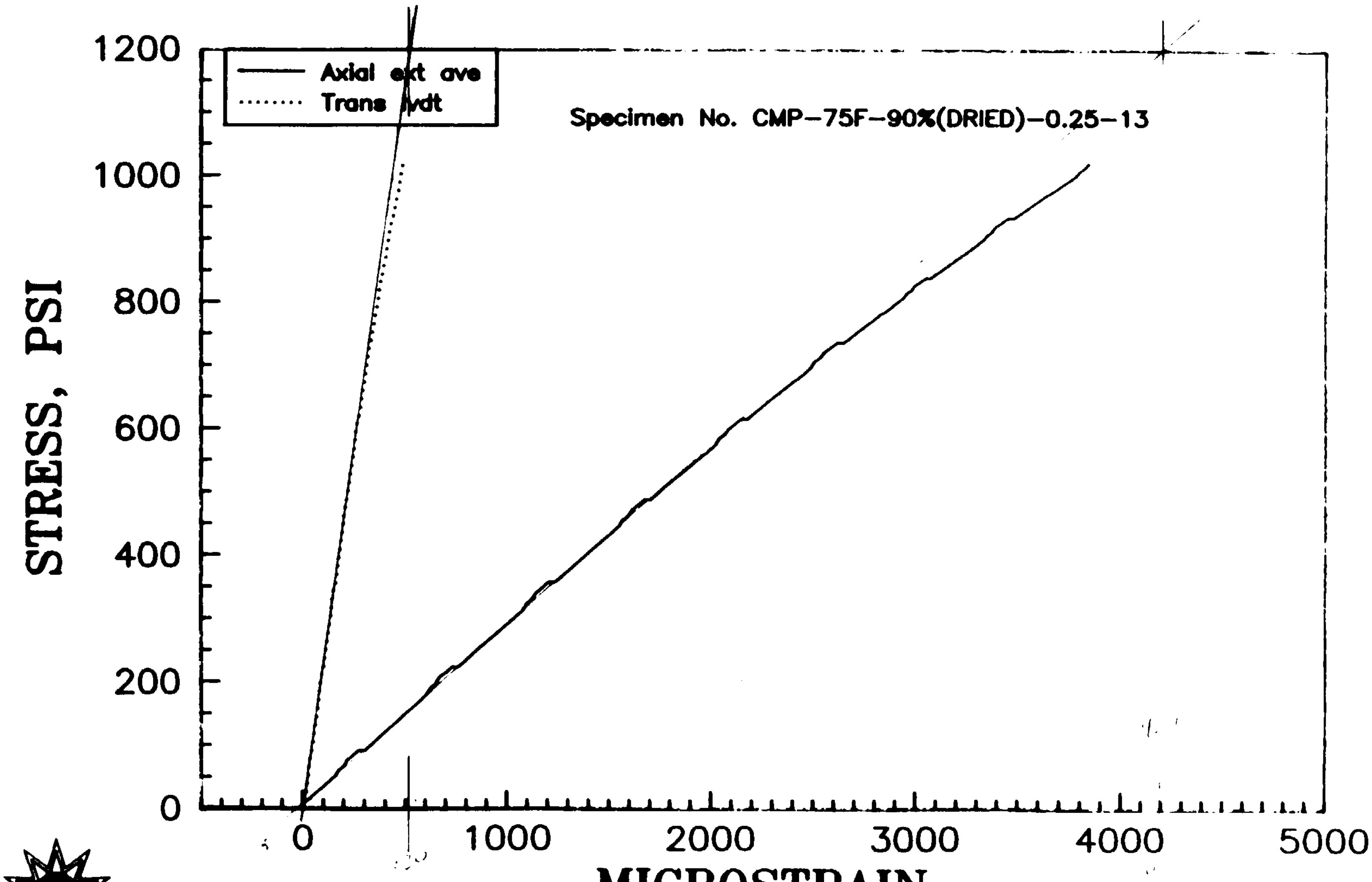
PVA/MB SOLUBLE CORE COMPRESSION TEST AGED AT 90°F, 90% RH; THEN DRIED AT 180°F



PVA/MB SOLUBLE CORE COMPRESSION TEST AGED AT 90°F, 90% RH; THEN DRIED AT 180°F



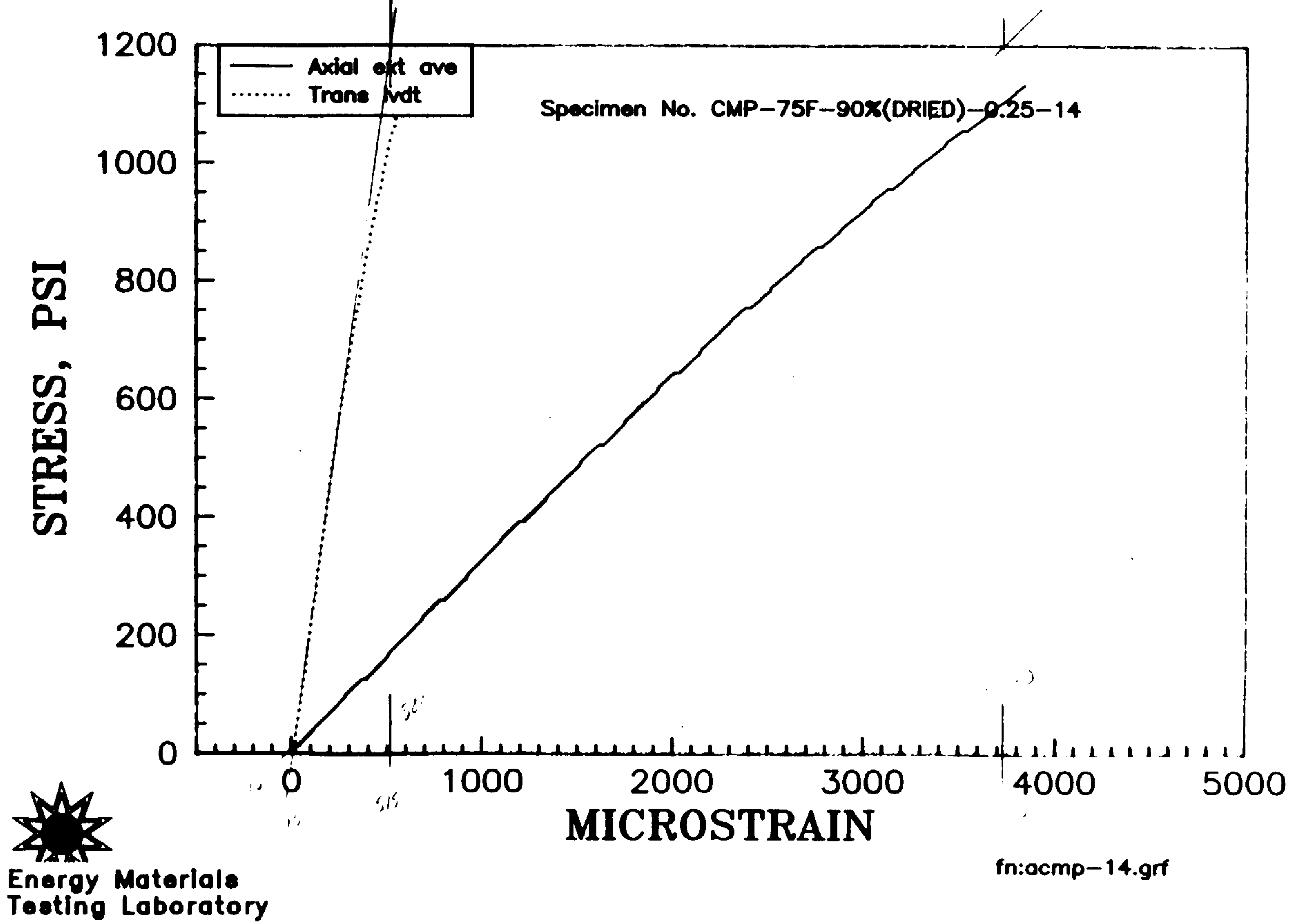
PVA/MB SOLUBLE CORE COMPRESSION TEST AGED AT 90°F, 90% RH; THEN DRIED AT 180°F



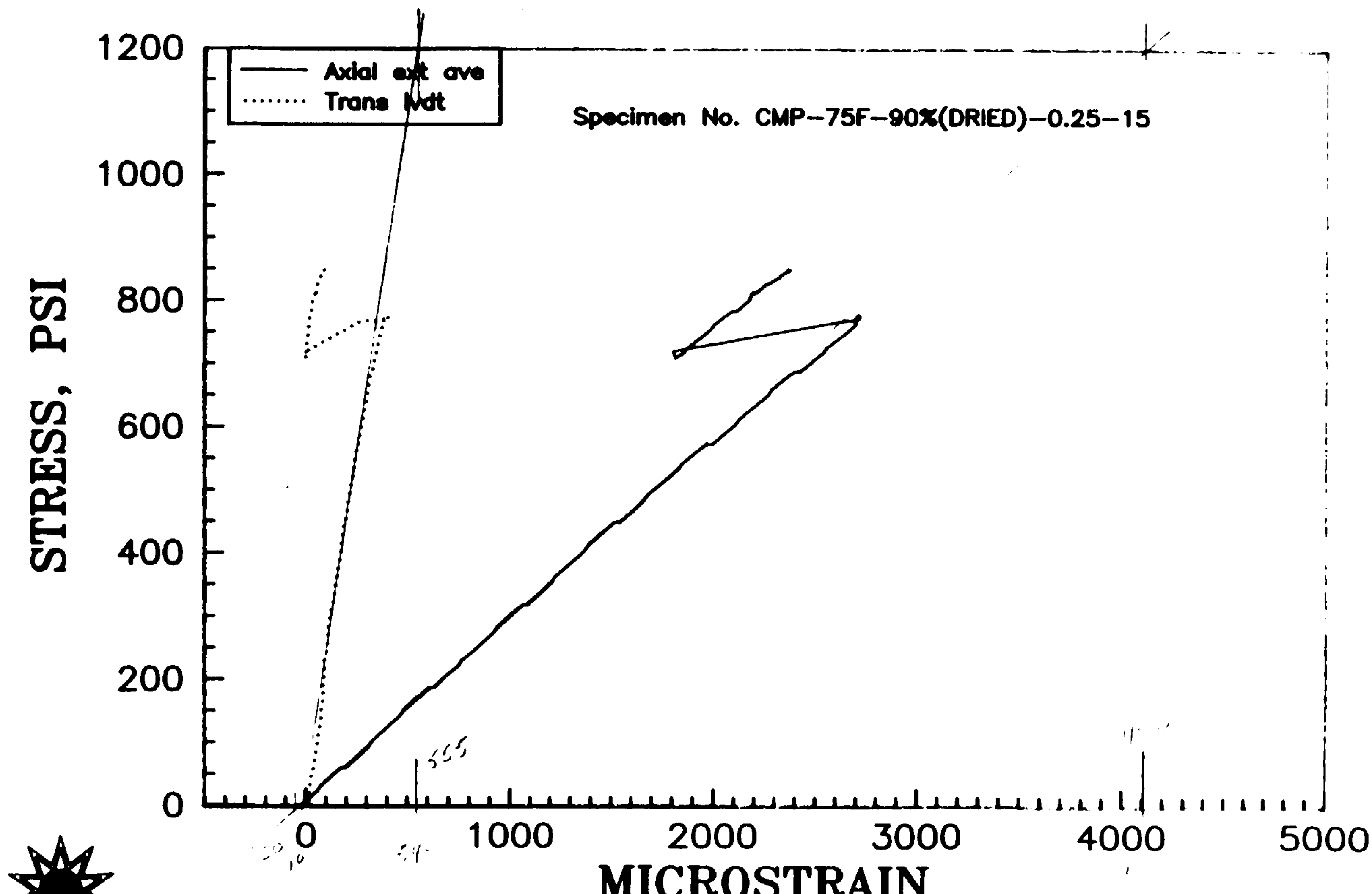
Energy Materials Testing Laboratory

fn:acmp-13.grf

PVA/MB SOLUBLE CORE COMPRESSION TEST
AGED AT 90°F, 90% RH; THEN DRIED AT 180°F



PVA/MB SOLUBLE CORE COMPRESSION TEST
AGED AT 90°F, 90% RH; THEN DRIED AT 180°F



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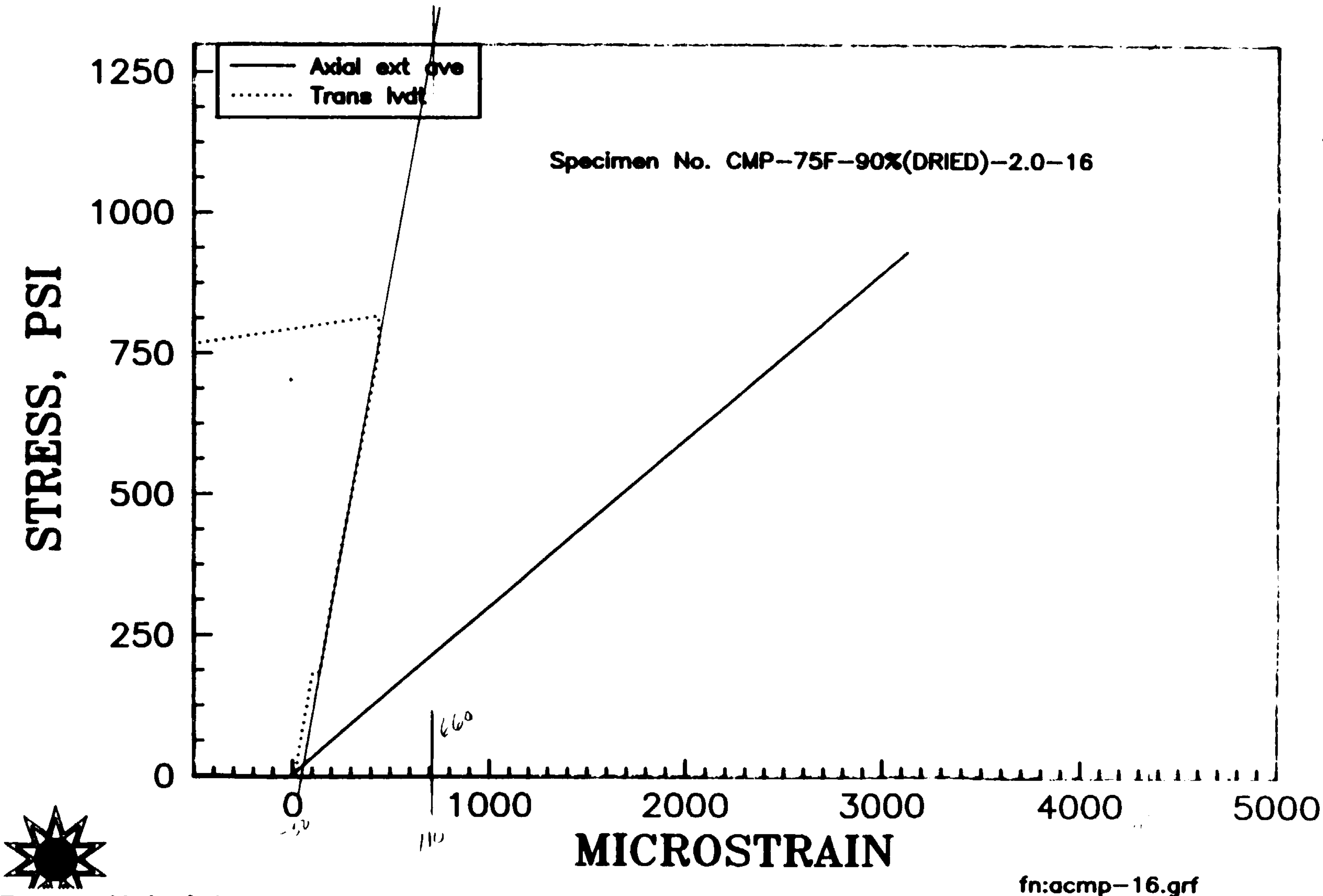
PVA/MB SOLUBLE CORE COMPRESSION TEST AGED AT 90°F, 90% RH; THEN DRIED AT 180°F



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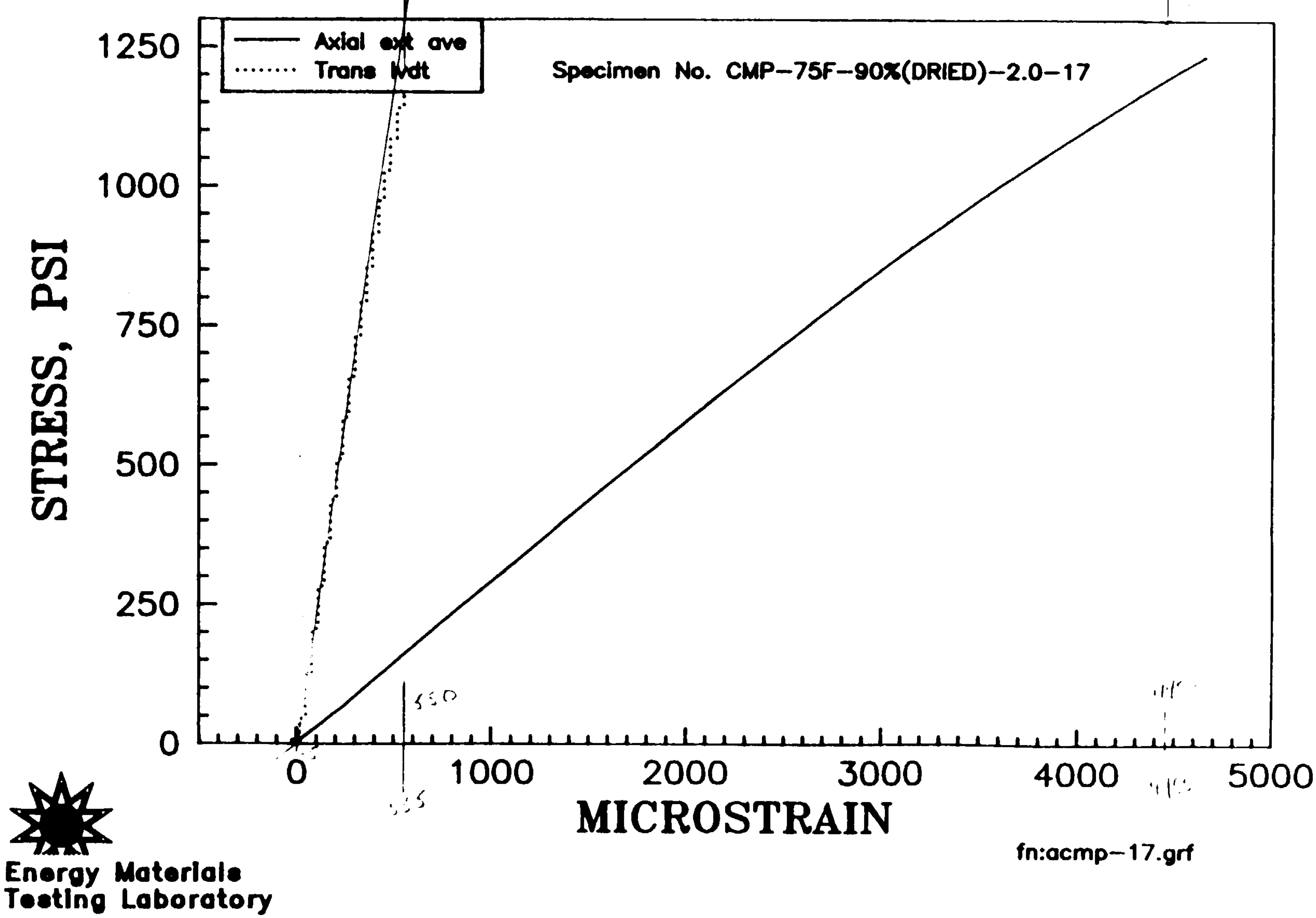
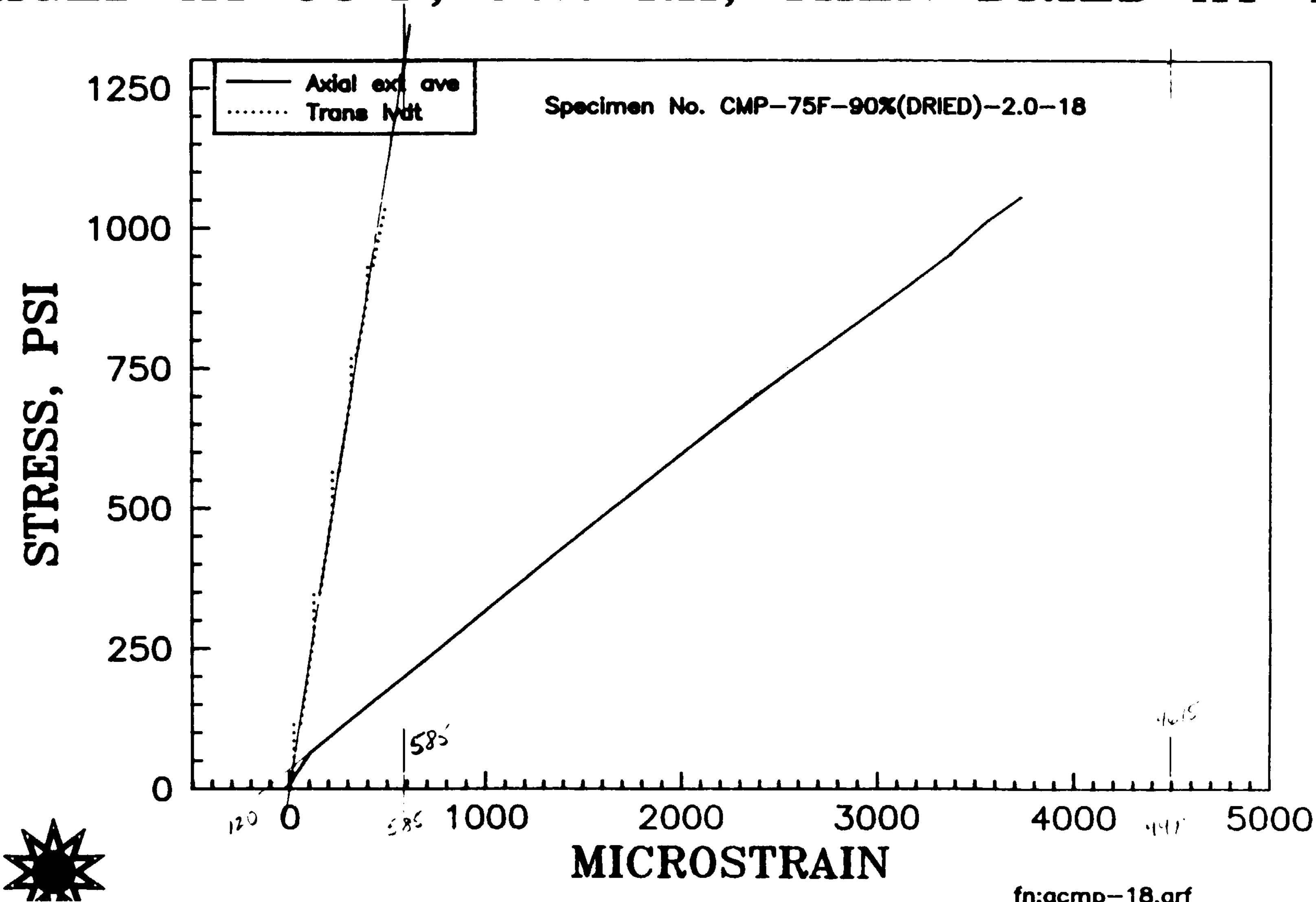
PVA/MB SOLUBLE CORE COMPRESSION TEST AGED AT 90°F, 90% RH; THEN DRIED AT 180°F



PVA/MB SOLUBLE CORE COMPRESSION TEST
AGED AT 90°F, 90% RH; THEN DRIED AT 180°F



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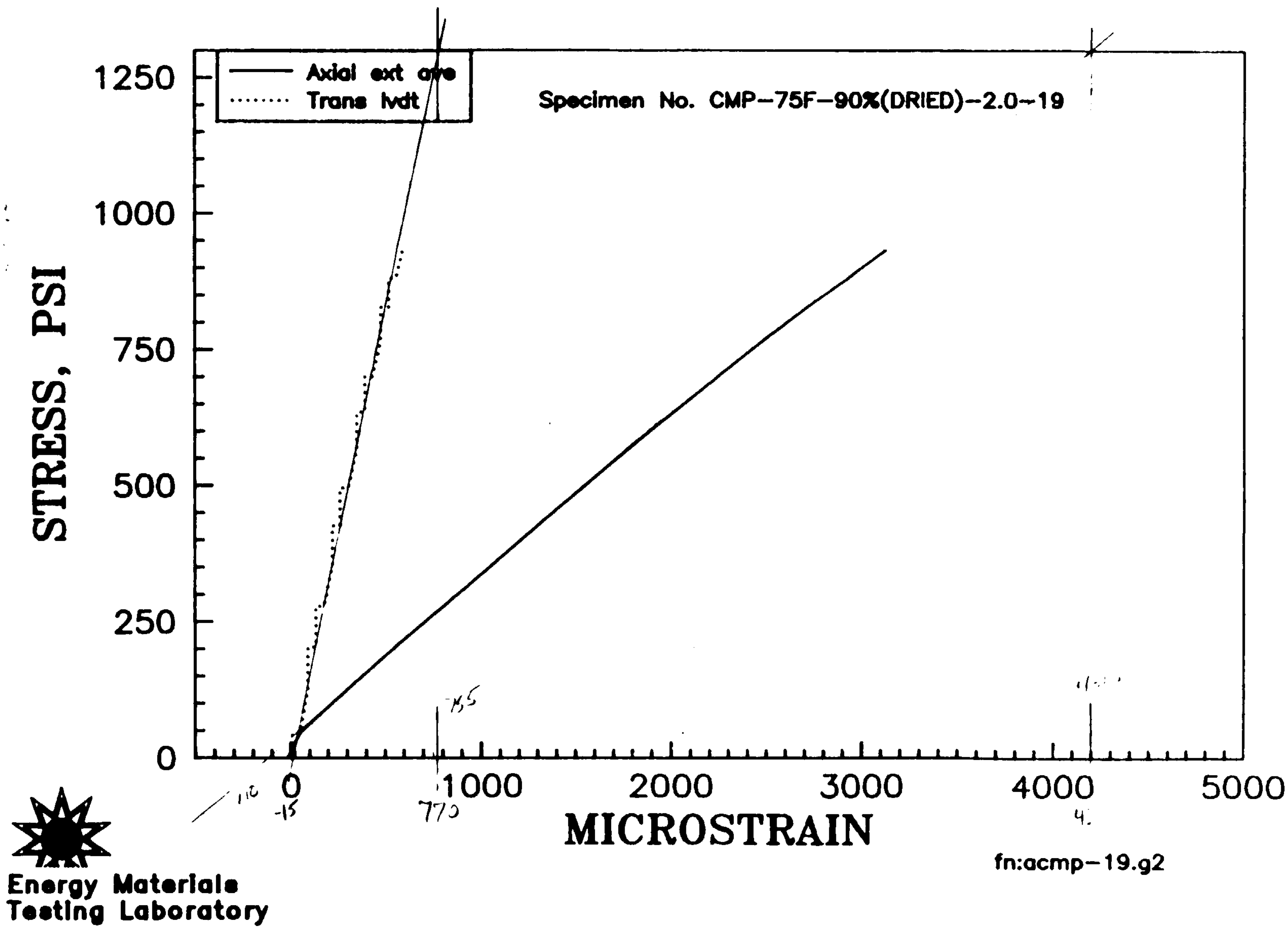
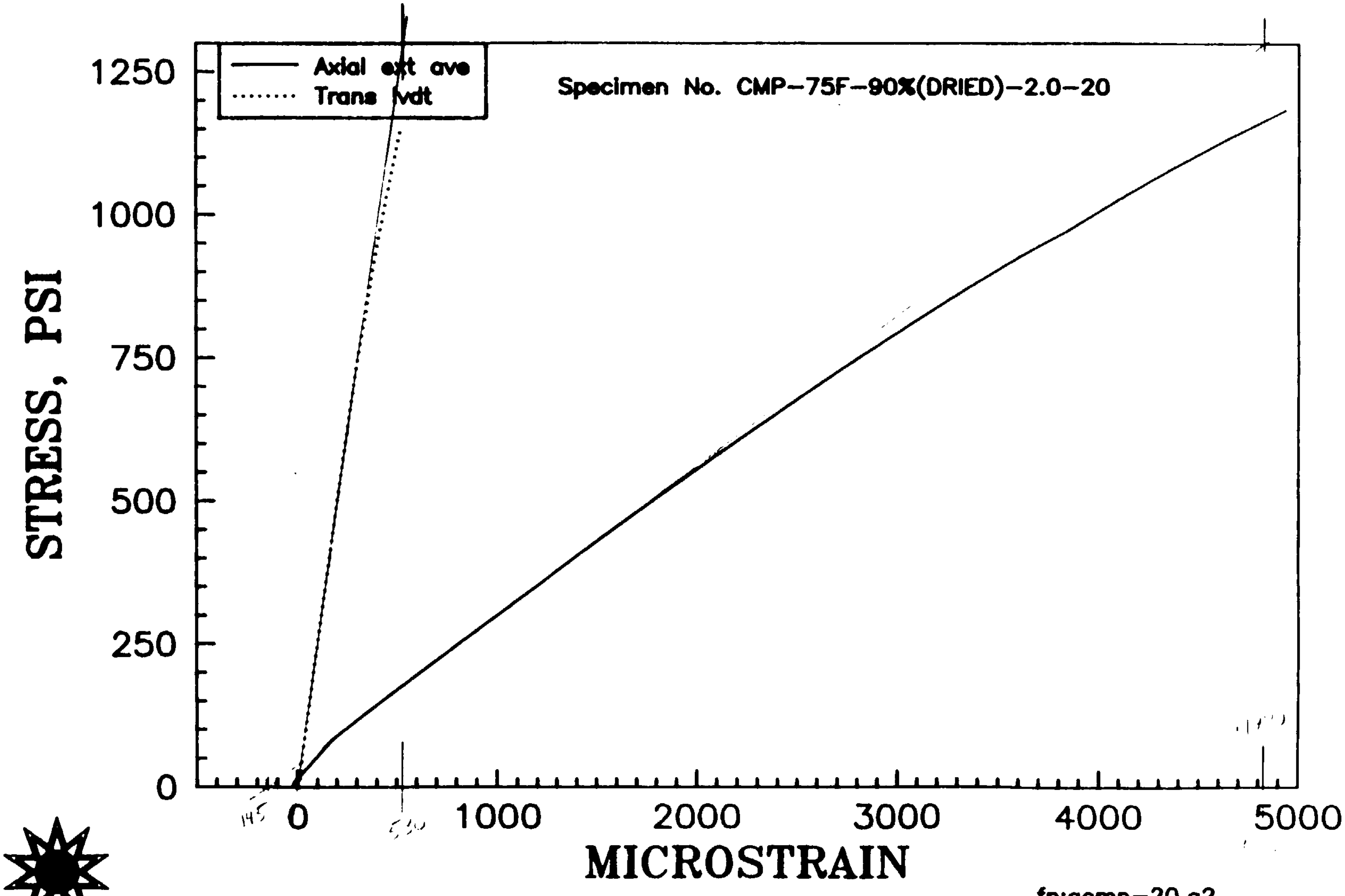
PVA/MB SOLUBLE CORE COMPRESSION TEST AGED AT 90°F, 90% RH; THEN DRIED AT 180°F



PVA/MB SOLUBLE CORE COMPRESSION TEST AGED AT 90°F, 90% RH; THEN DRIED AT 180°F



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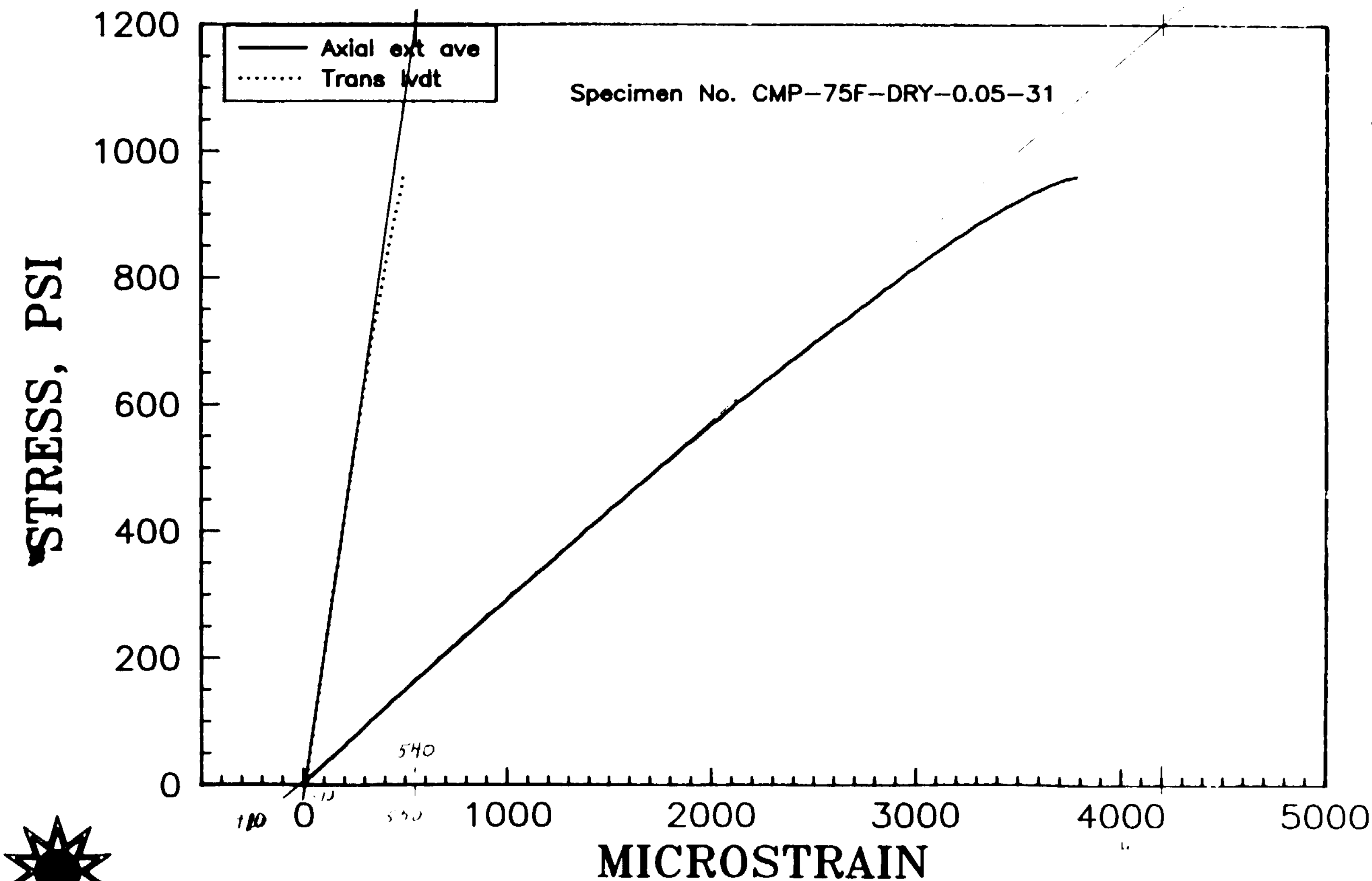
PVA/MB SOLUBLE CORE COMPRESSION TEST
BASELINE SAMPLES; NO HIGH HUMIDITY AGING



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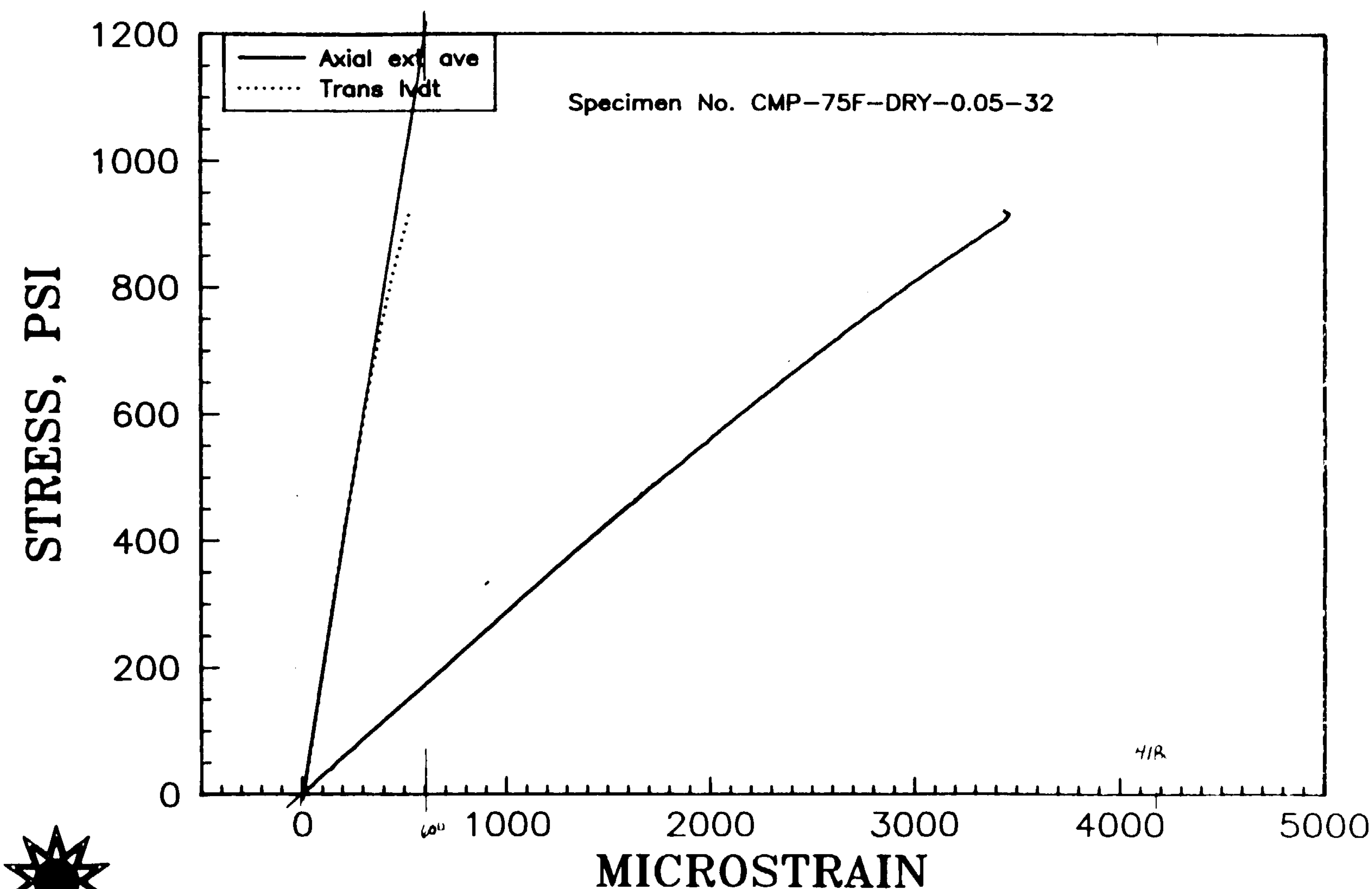
PVA/MB SOLUBLE CORE COMPRESSION TEST BASELINE SAMPLES; NO HIGH HUMIDITY AGING



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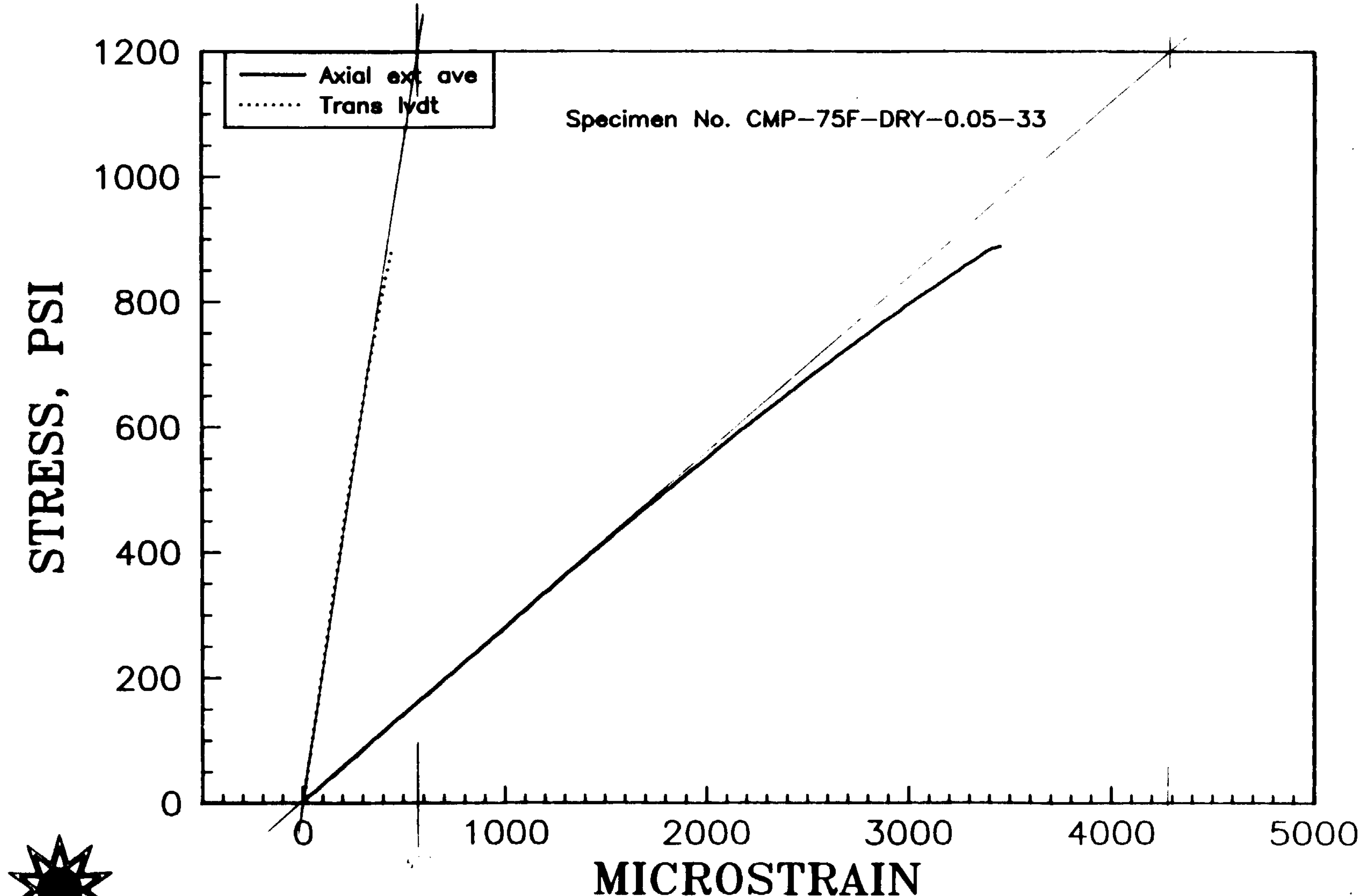
PVA/MB SOLUBLE CORE COMPRESSION TEST
BASELINE SAMPLES; NO HIGH HUMIDITY AGING



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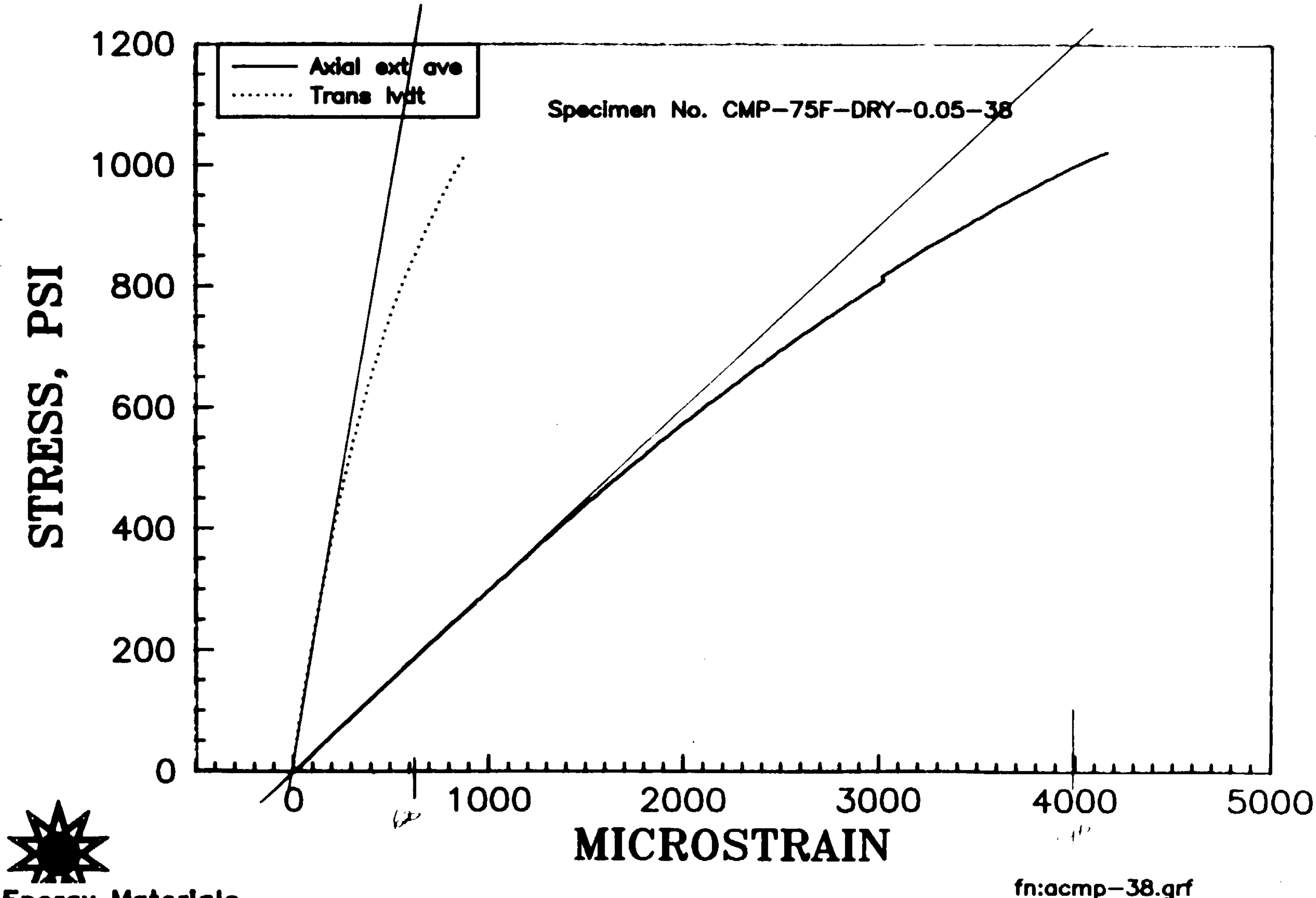
PVA/MB SOLUBLE CORE COMPRESSION TEST BASELINE SAMPLES; NO HIGH HUMIDITY AGING



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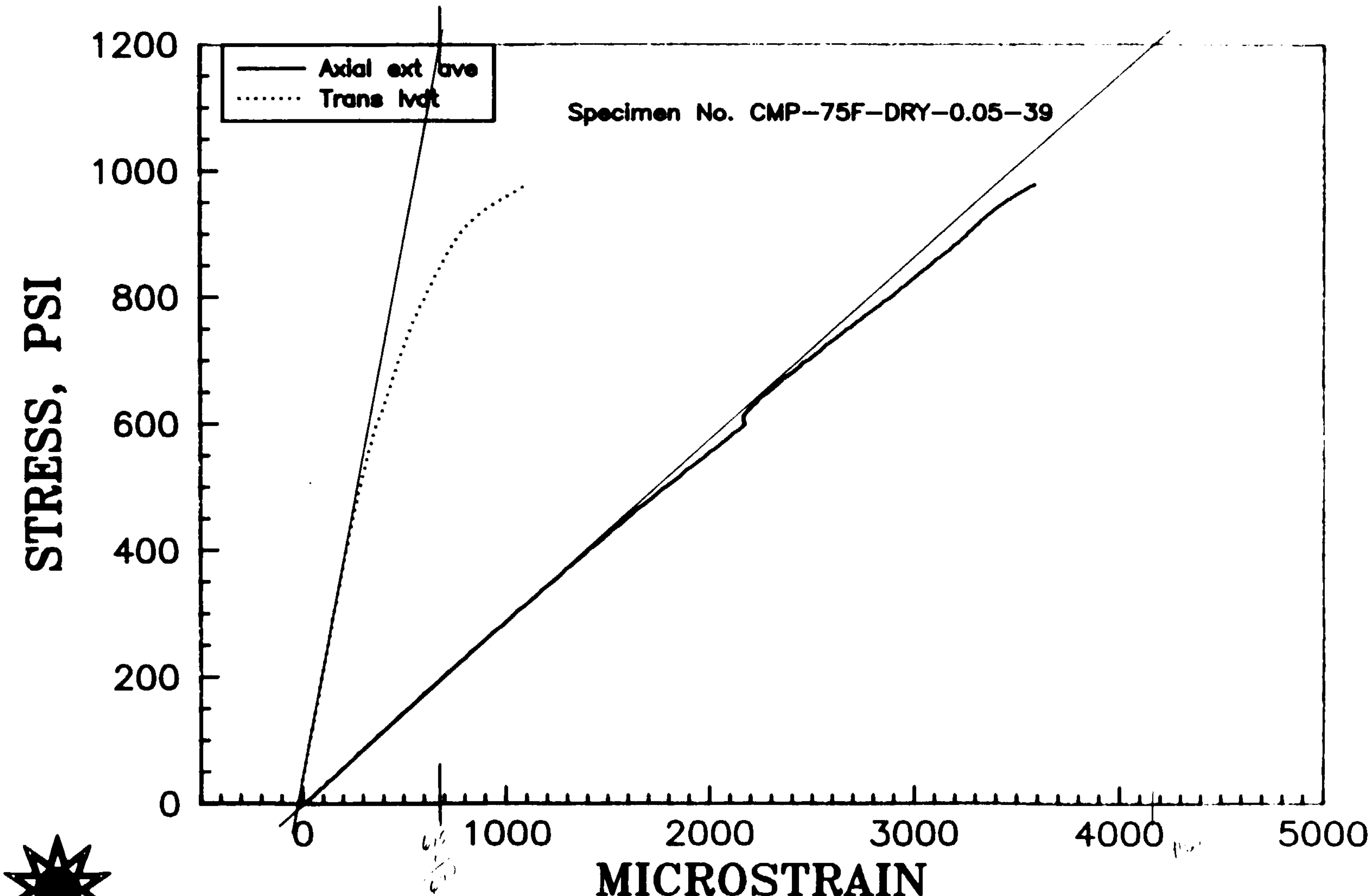
PVA/MB SOLUBLE CORE COMPRESSION TEST BASELINE SAMPLES; NO HIGH HUMIDITY AGING



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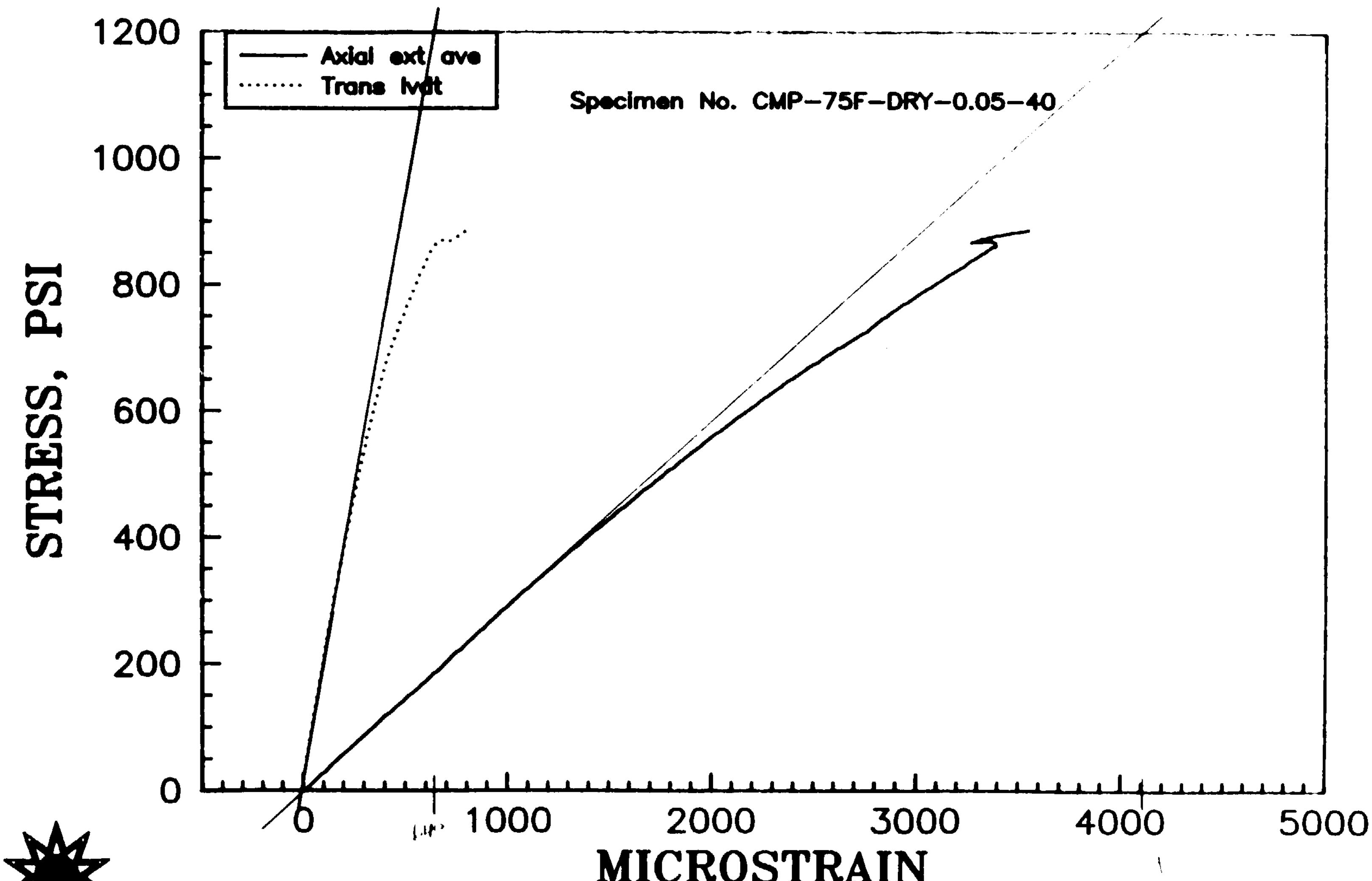
Testing Laboratory

fn:acmp-39.grf

6

PVA/MB SOLUBLE CORE COMPRESSION TEST BASELINE SAMPLES; NO HIGH HUMIDITY AGING



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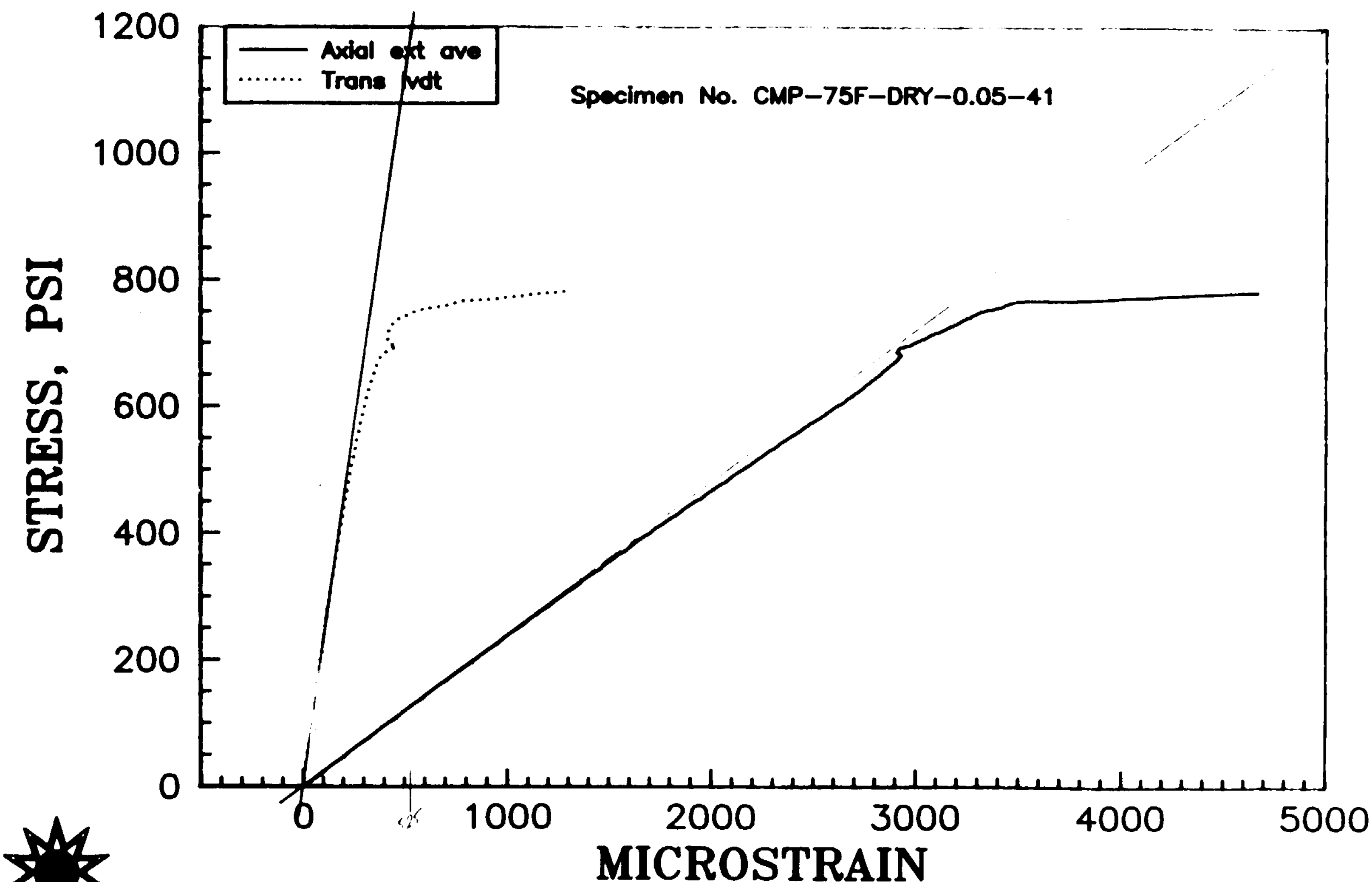
fn:acmp-40.grf

PVA/MB SOLUBLE CORE COMPRESSION TEST
BASELINE SAMPLES; NO HIGH HUMIDITY AGING



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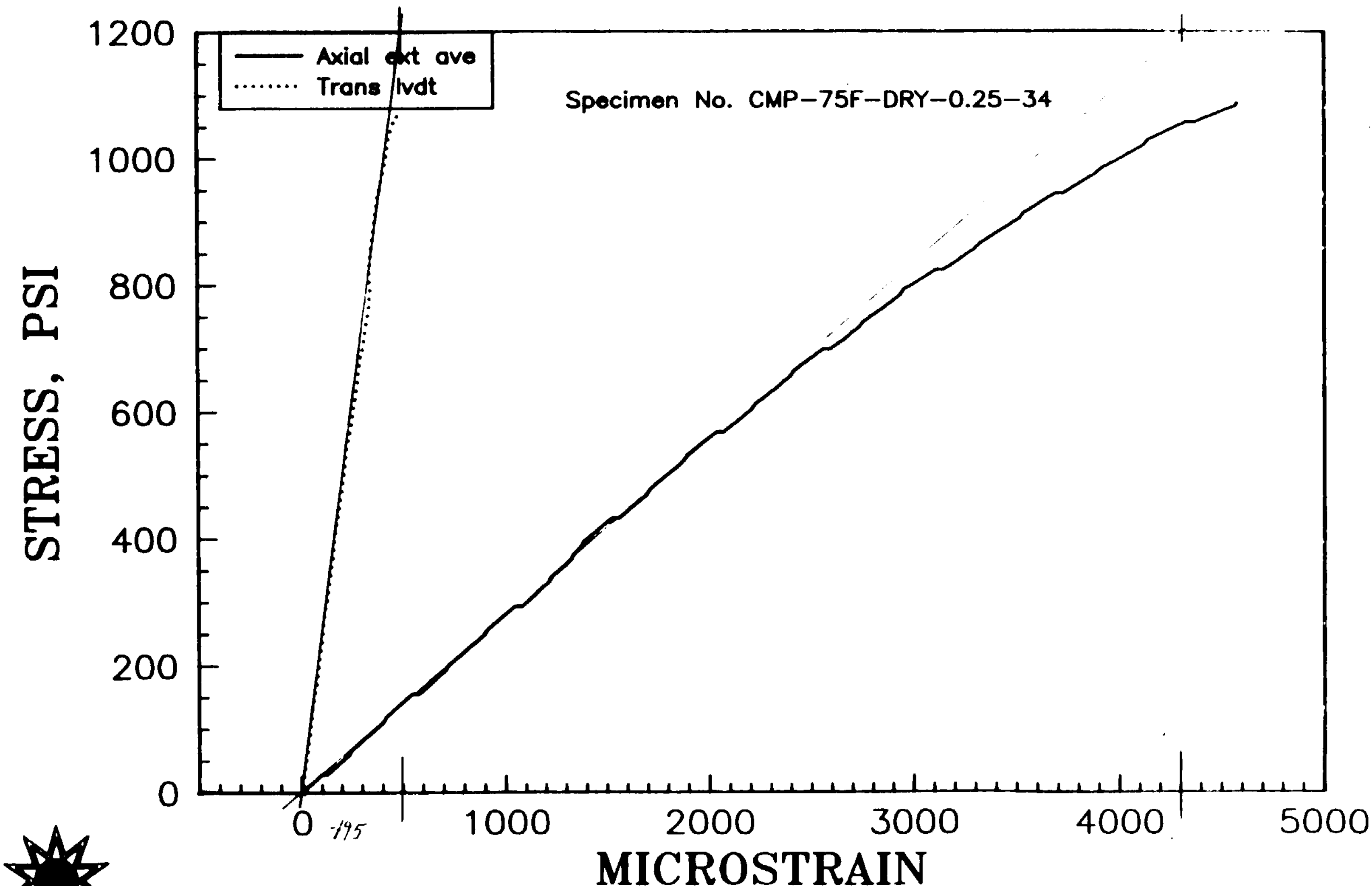
fn:acmp-41.grf

PVA/MB SOLUBLE CORE COMPRESSION TEST
BASELINE SAMPLES; NO HIGH HUMIDITY AGING



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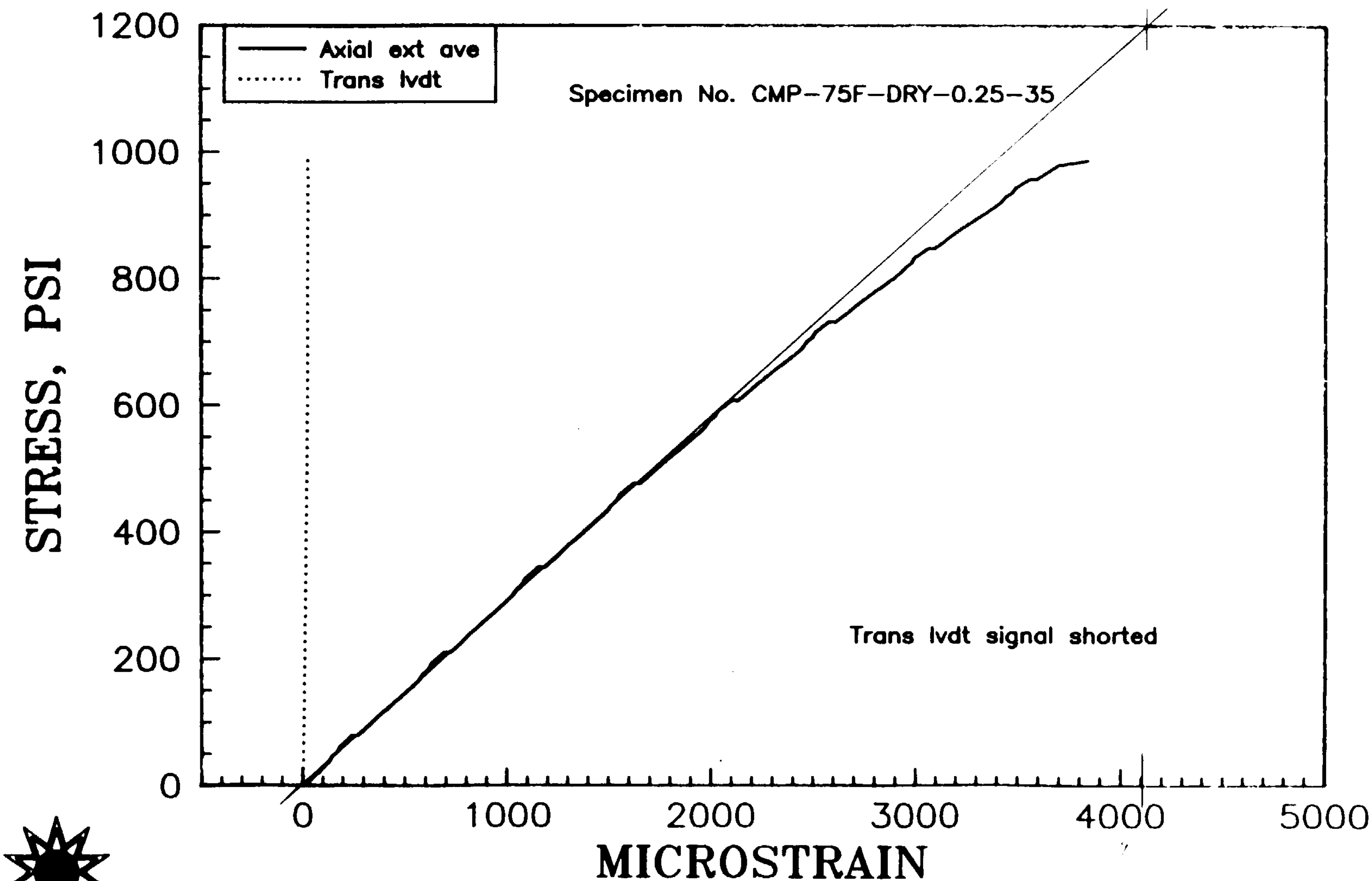
PVA/MB SOLUBLE CORE COMPRESSION TEST BASELINE SAMPLES; NO HIGH HUMIDITY AGING



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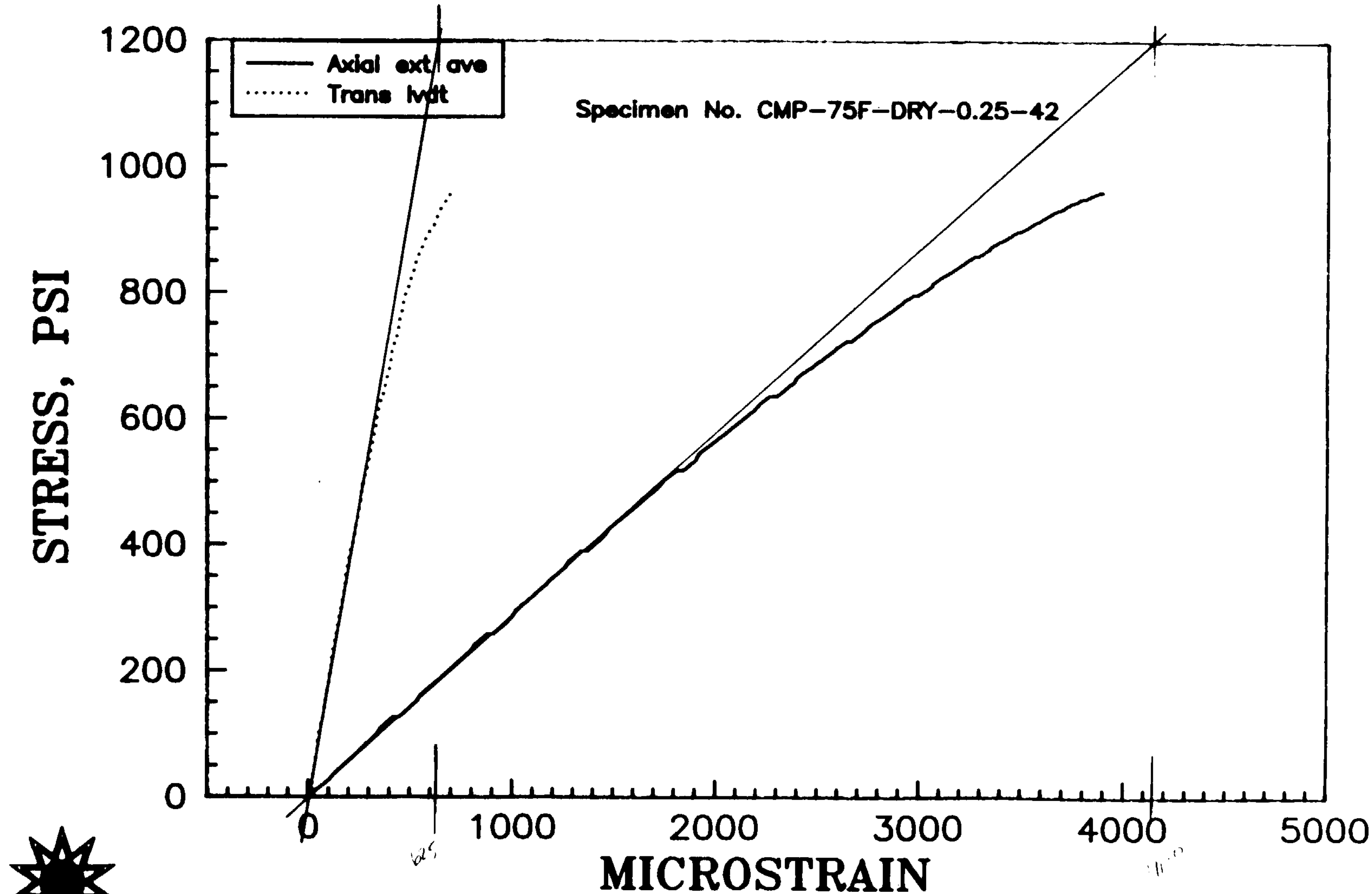
fn:acmp-35.grf

PVA/MB SOLUBLE CORE COMPRESSION TEST BASELINE SAMPLES; NO HIGH HUMIDITY AGING



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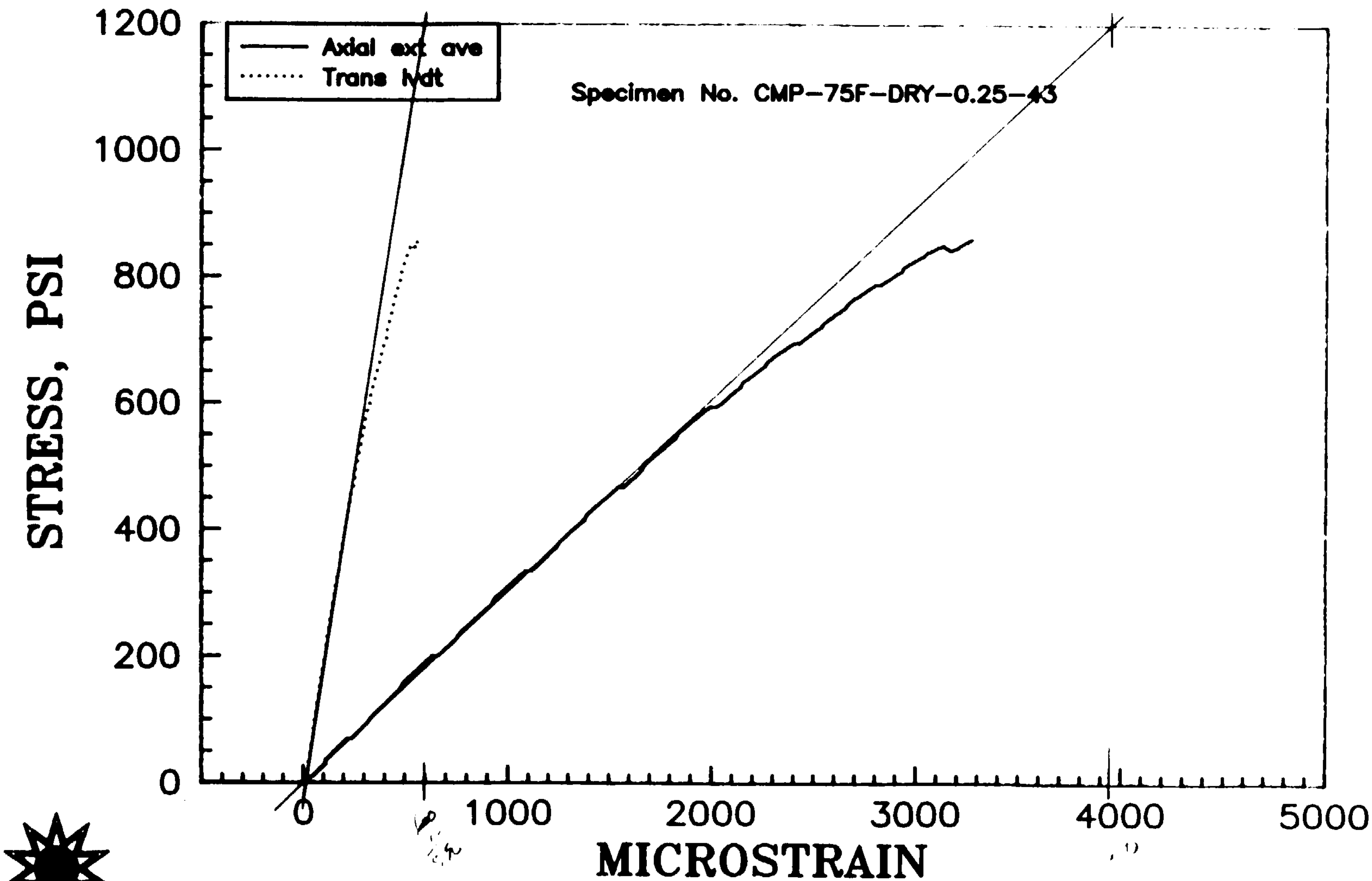
PVA/MB SOLUBLE CORE COMPRESSION TEST
BASELINE SAMPLES; NO HIGH HUMIDITY AGING



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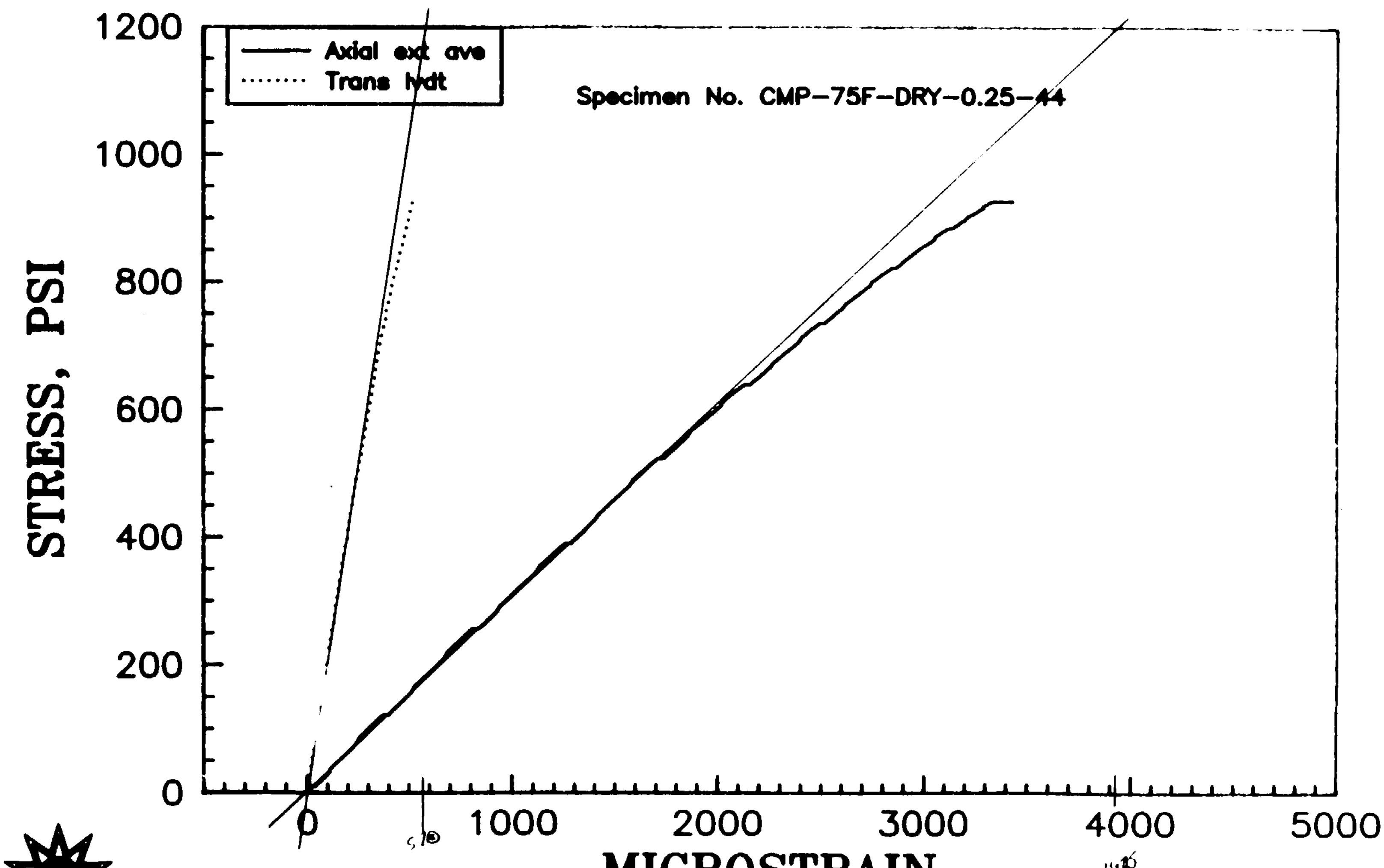
PVA/MB SOLUBLE CORE COMPRESSION TEST BASELINE SAMPLES; NO HIGH HUMIDITY AGING



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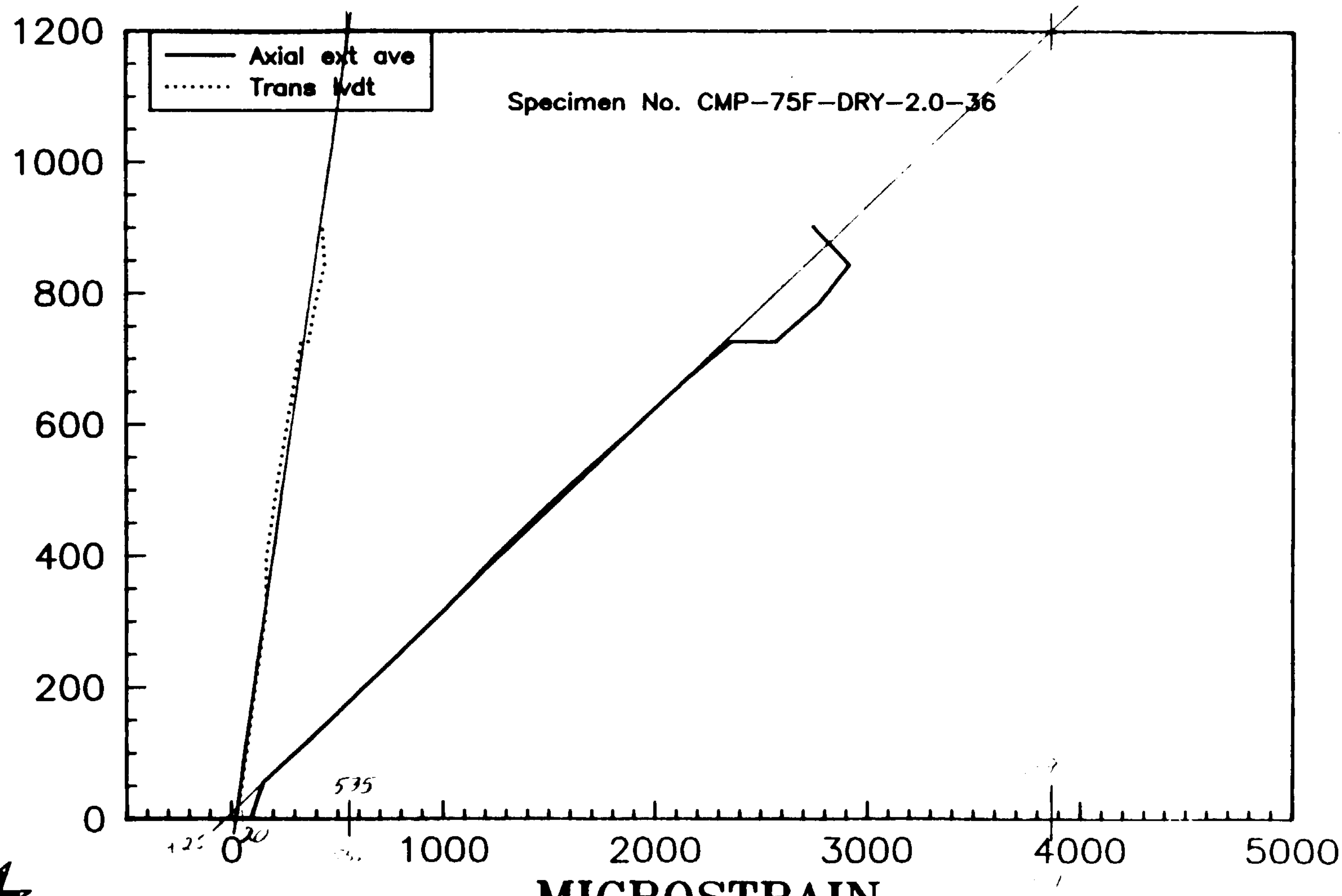
fn:acmp-44.grf

PVA/MB SOLUBLE CORE COMPRESSION TEST
BASELINE SAMPLES; NO HIGH HUMIDITY AGING



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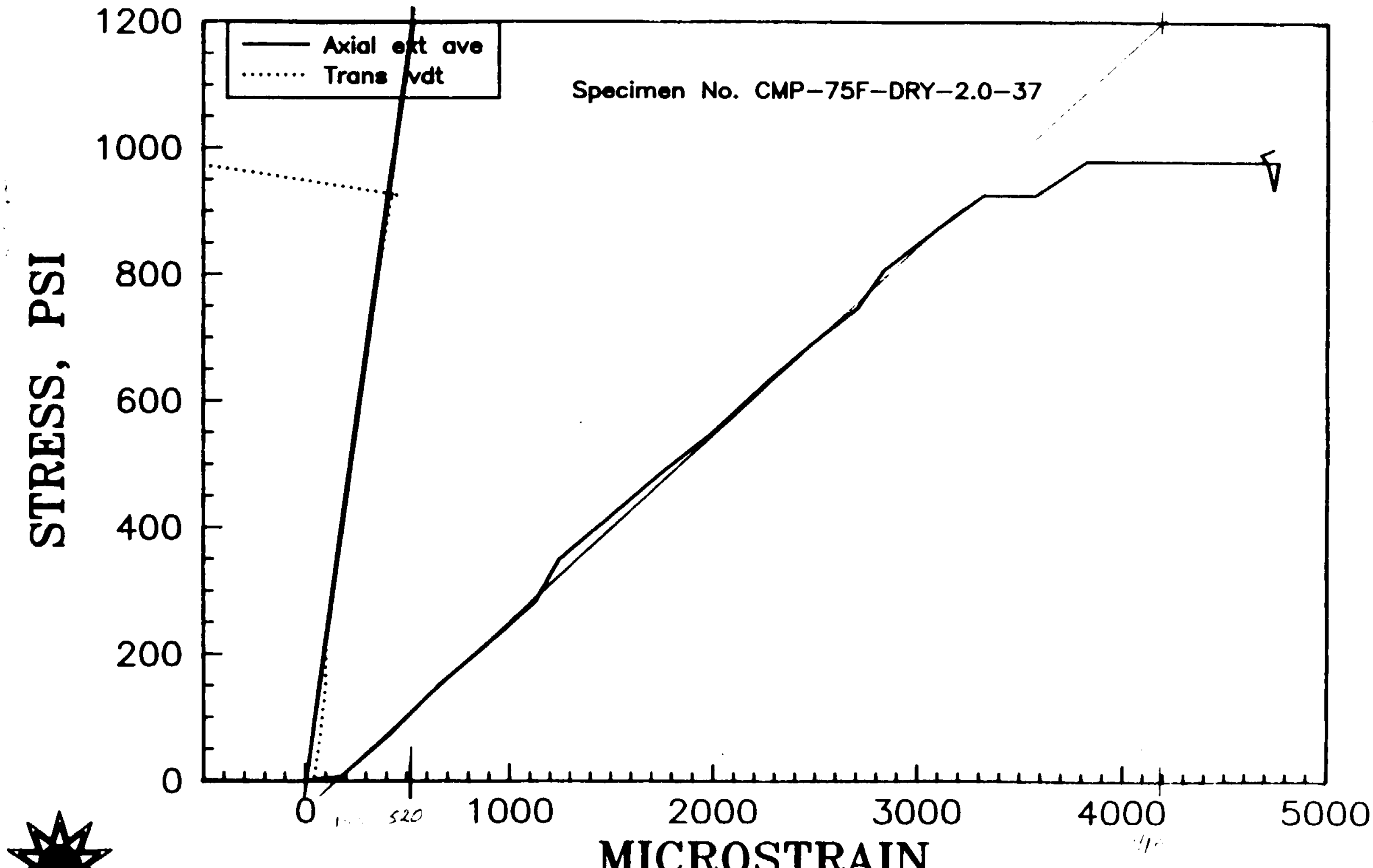
PVA/MB SOLUBLE CORE COMPRESSION TEST BASELINE SAMPLES; NO HIGH HUMIDITY AGING



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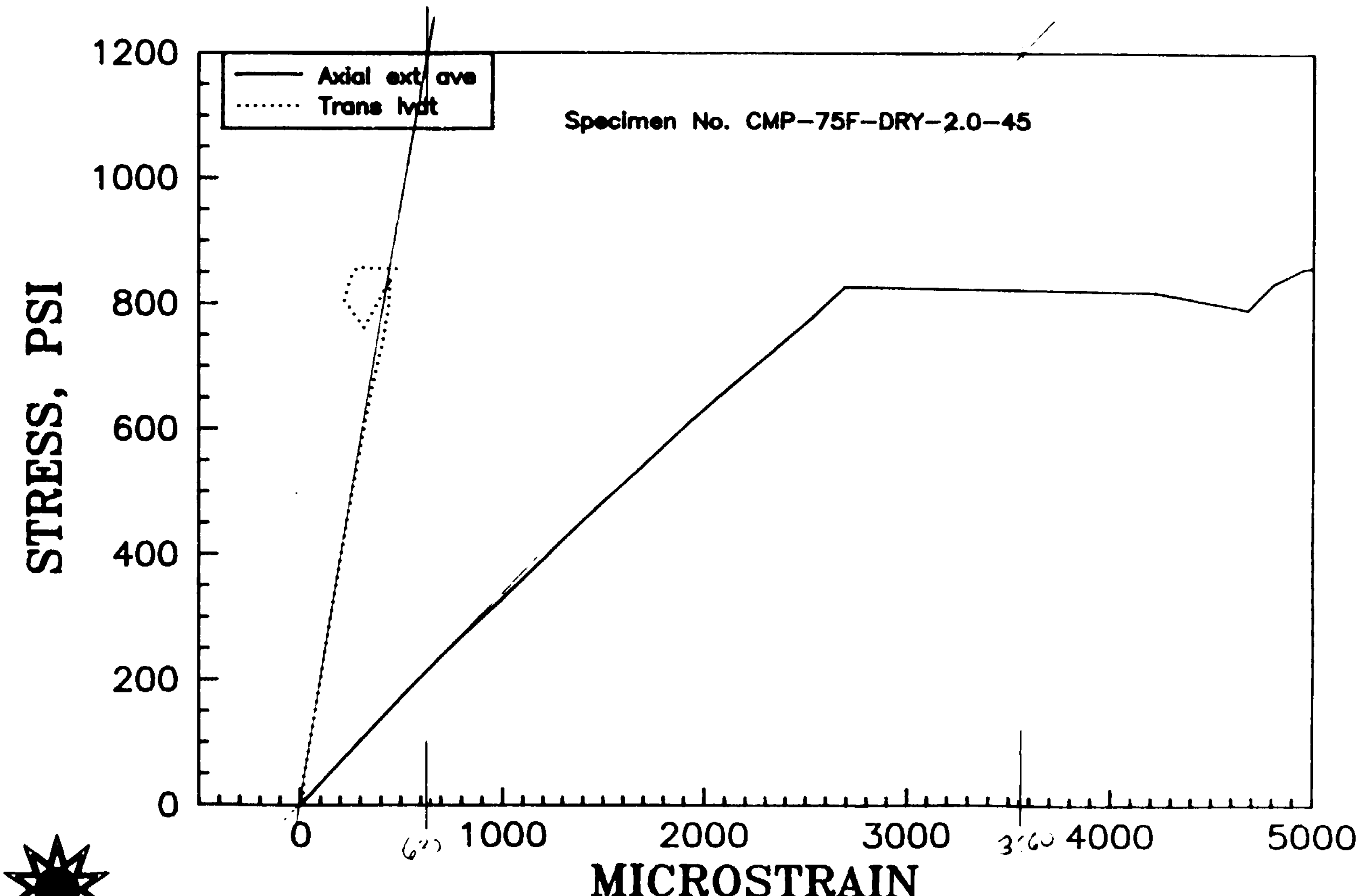
PVA/MB SOLUBLE CORE COMPRESSION TEST
BASELINE SAMPLES; NO HIGH HUMIDITY AGING



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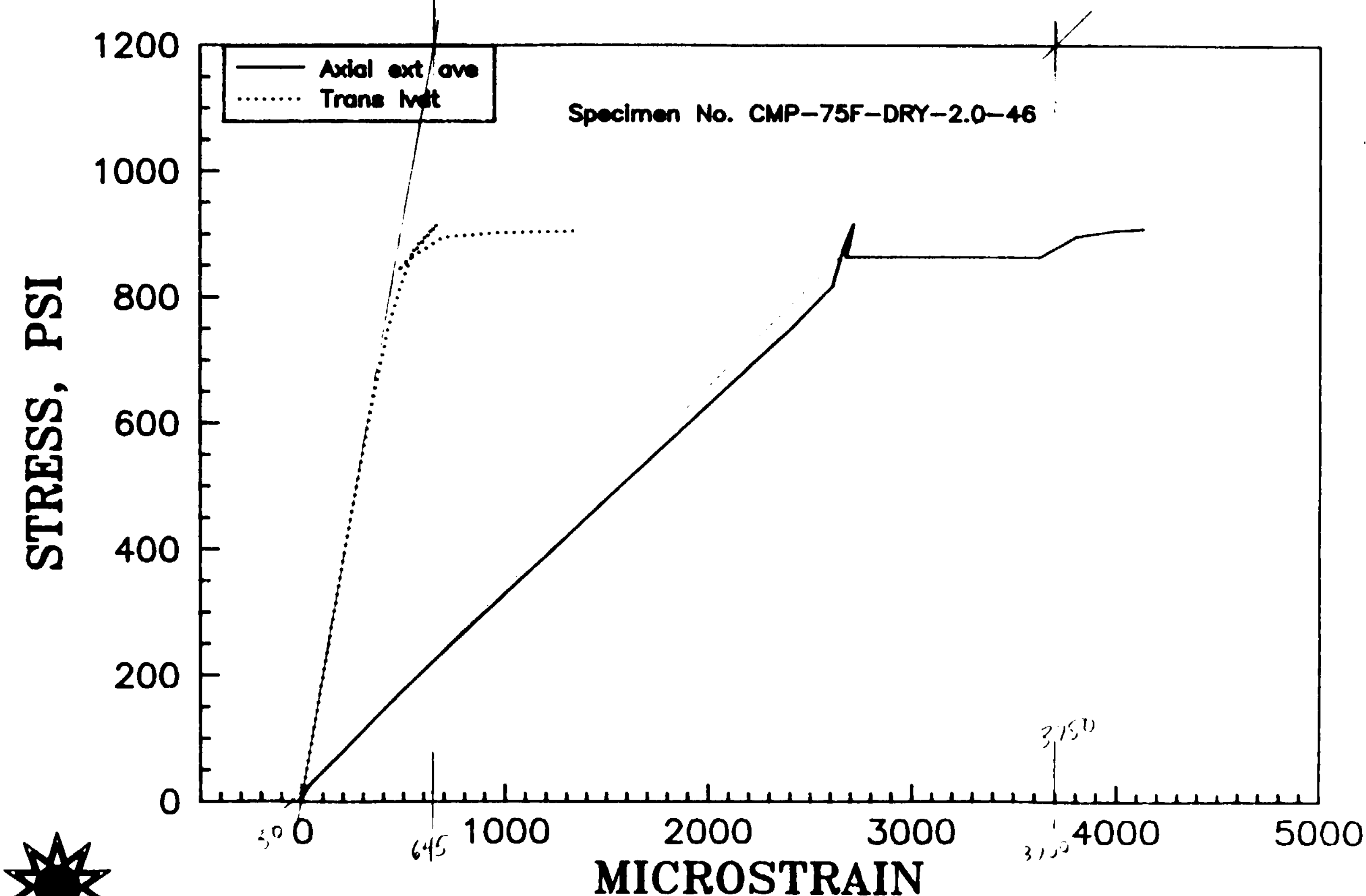
PVA/MB SOLUBLE CORE COMPRESSION TEST BASELINE SAMPLES; NO HIGH HUMIDITY AGING



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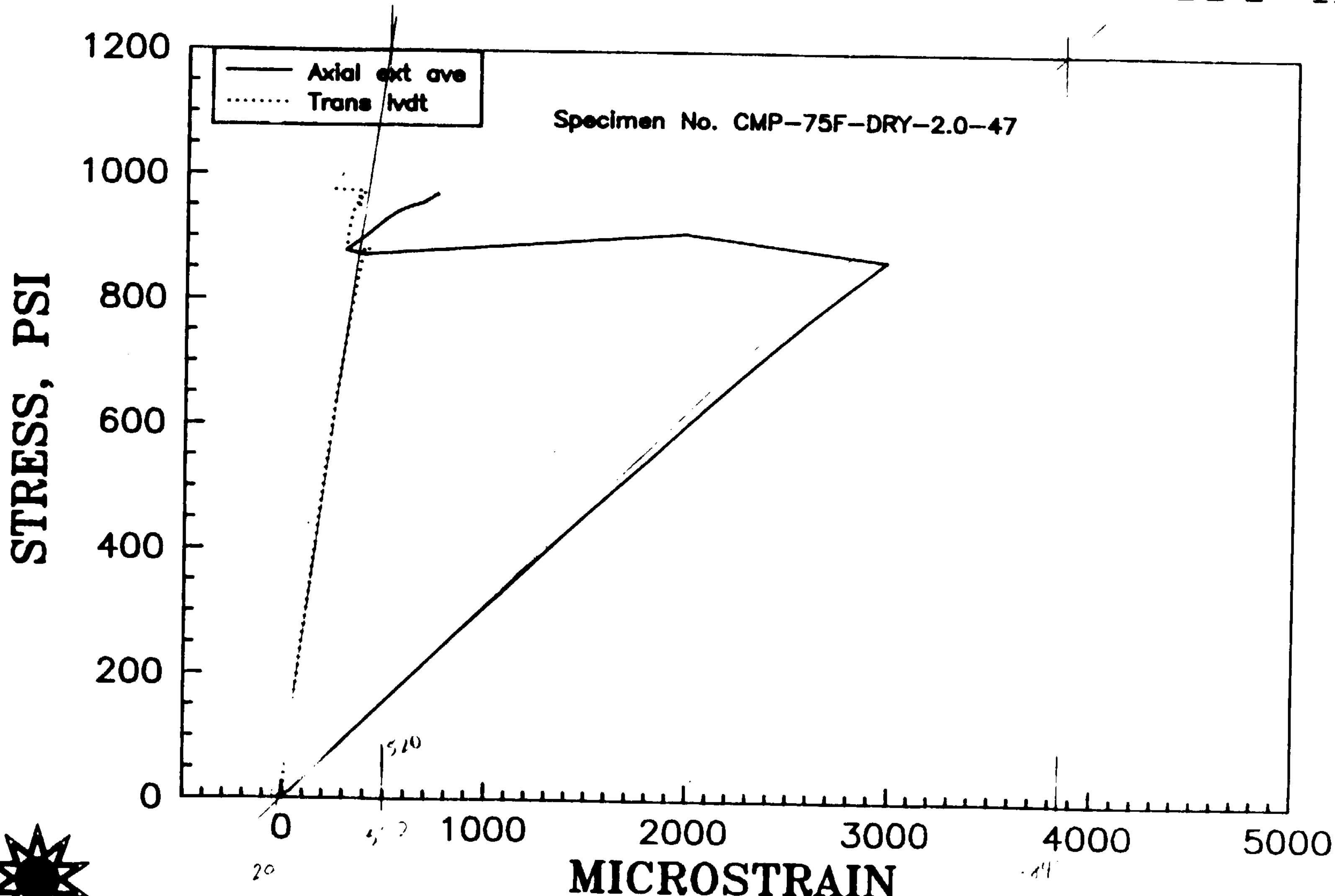
PVA/MB SOLUBLE CORE COMPRESSION TEST BASELINE SAMPLES; NO HIGH HUMIDITY AGING



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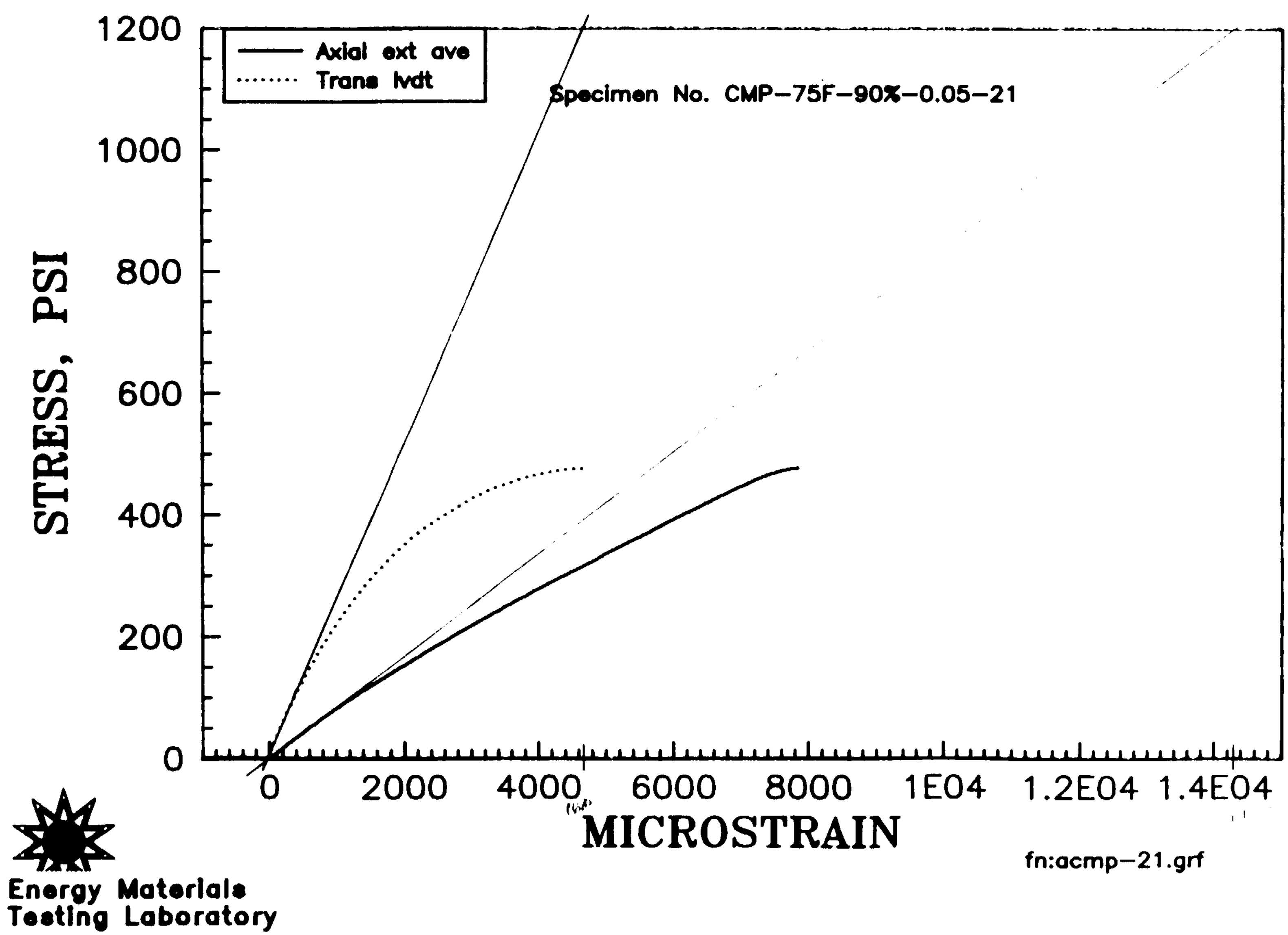
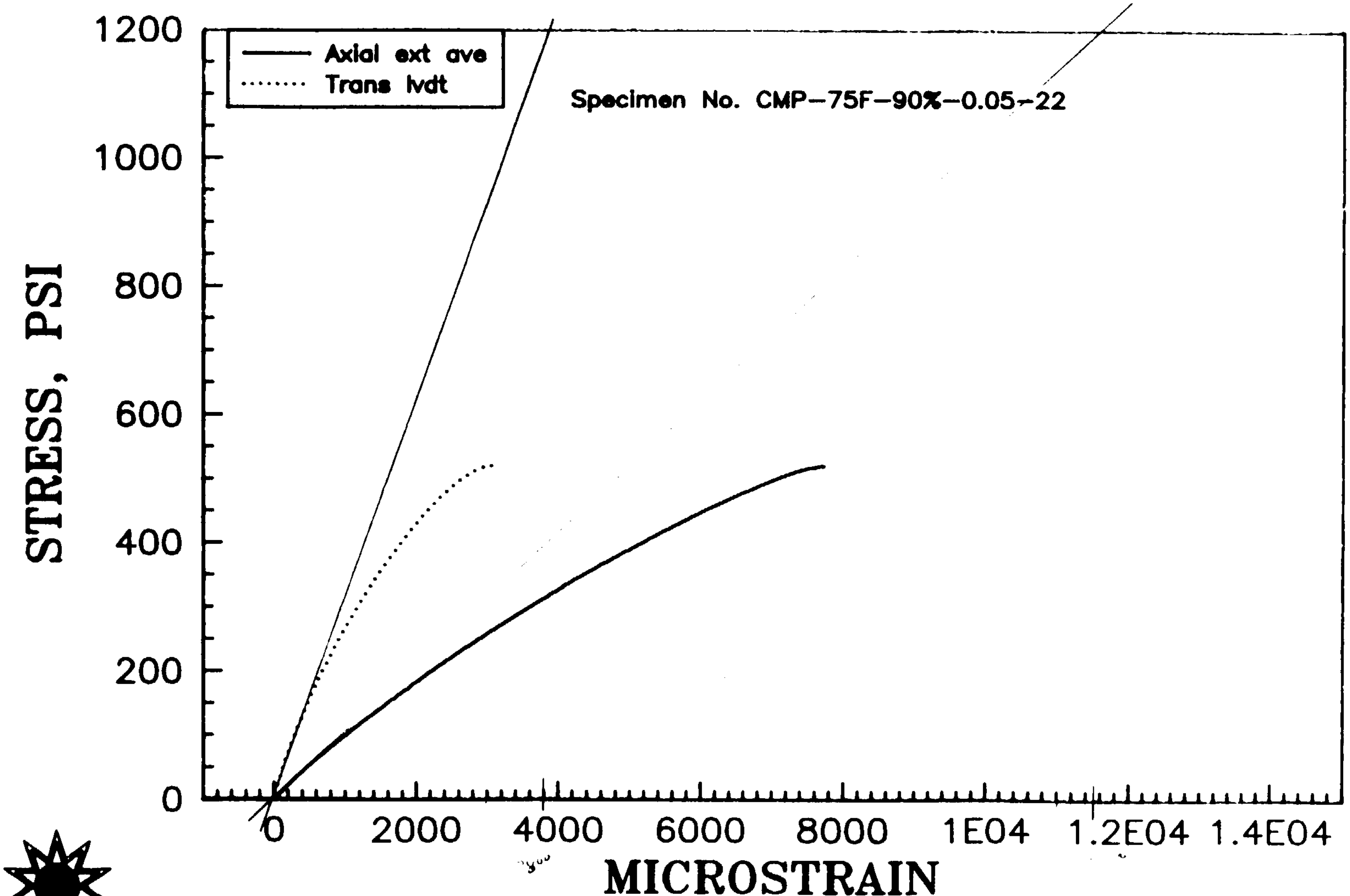
PVA/MB SOLUBLE CORE COMPRESSION TEST
AGED AT 90°F, 90% RH



PVA/MB SOLUBLE CORE COMPRESSION TEST AGED AT 90°F, 90% RH



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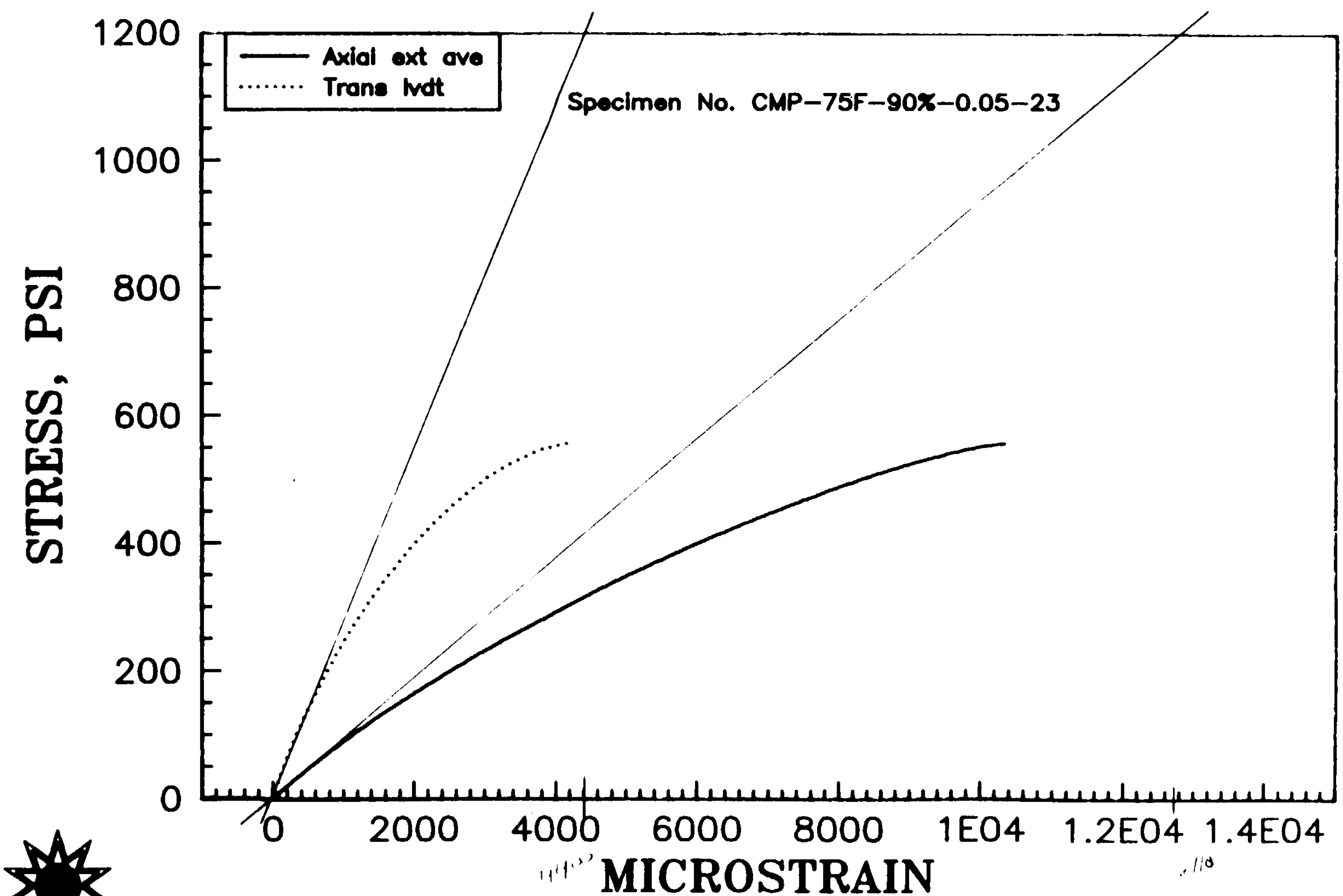
PVA/MB SOLUBLE CORE COMPRESSION TEST
AGED AT 90°F, 90% RH



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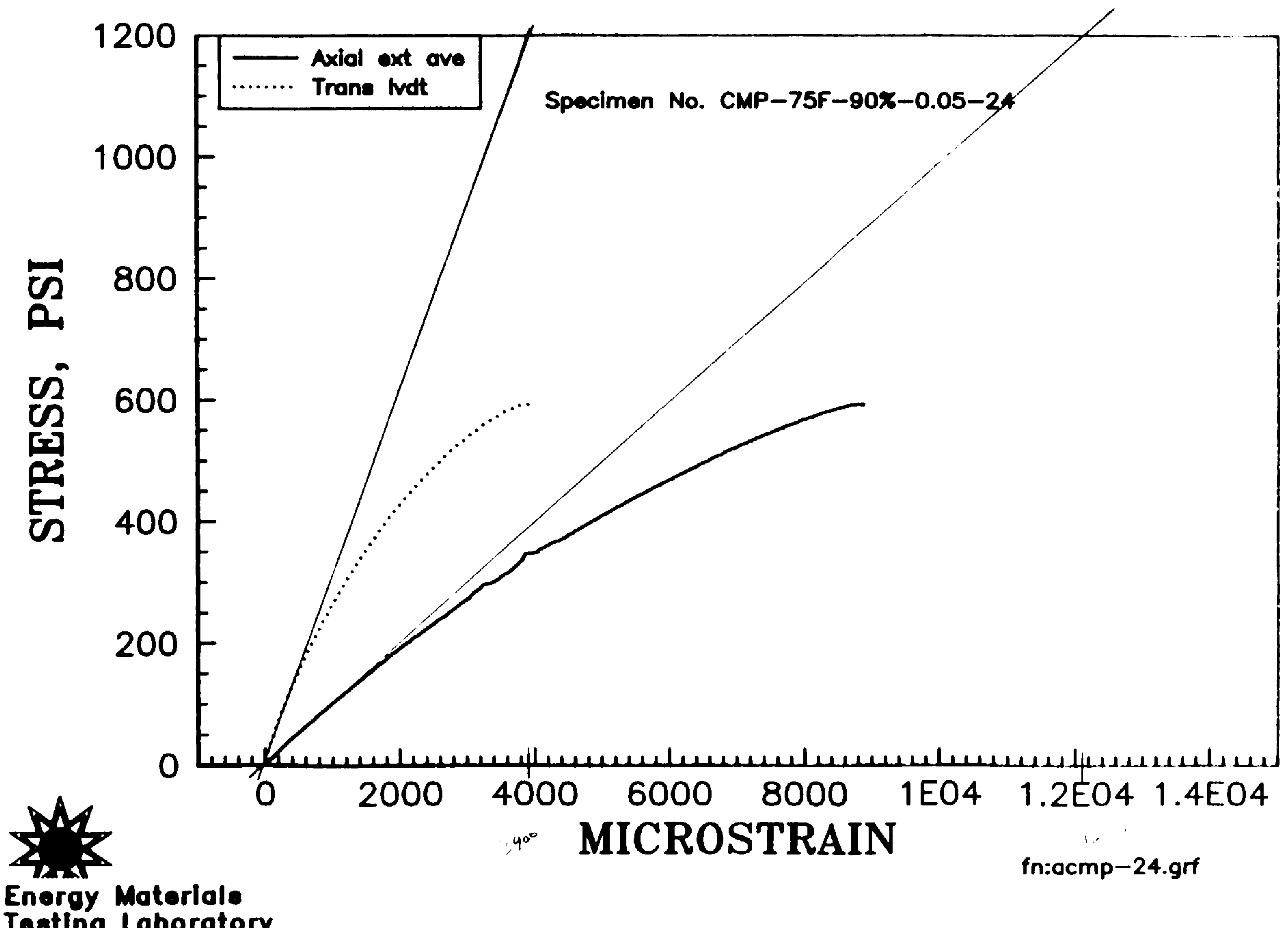
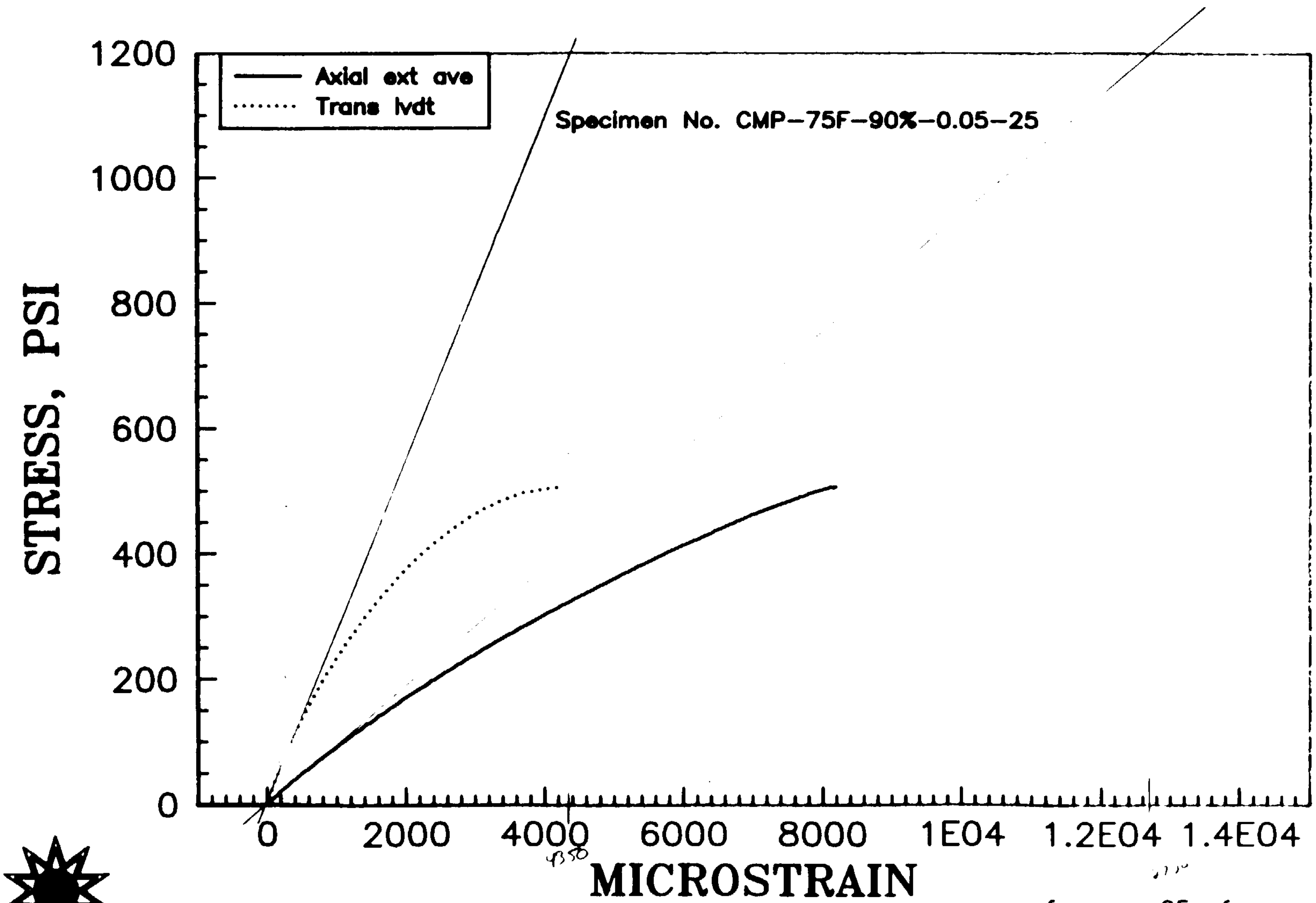
PVA/MB SOLUBLE CORE COMPRESSION TEST
AGED AT 90°F, 90% RH



PVA/MB SOLUBLE CORE COMPRESSION TEST
AGED AT 90°F, 90% RH



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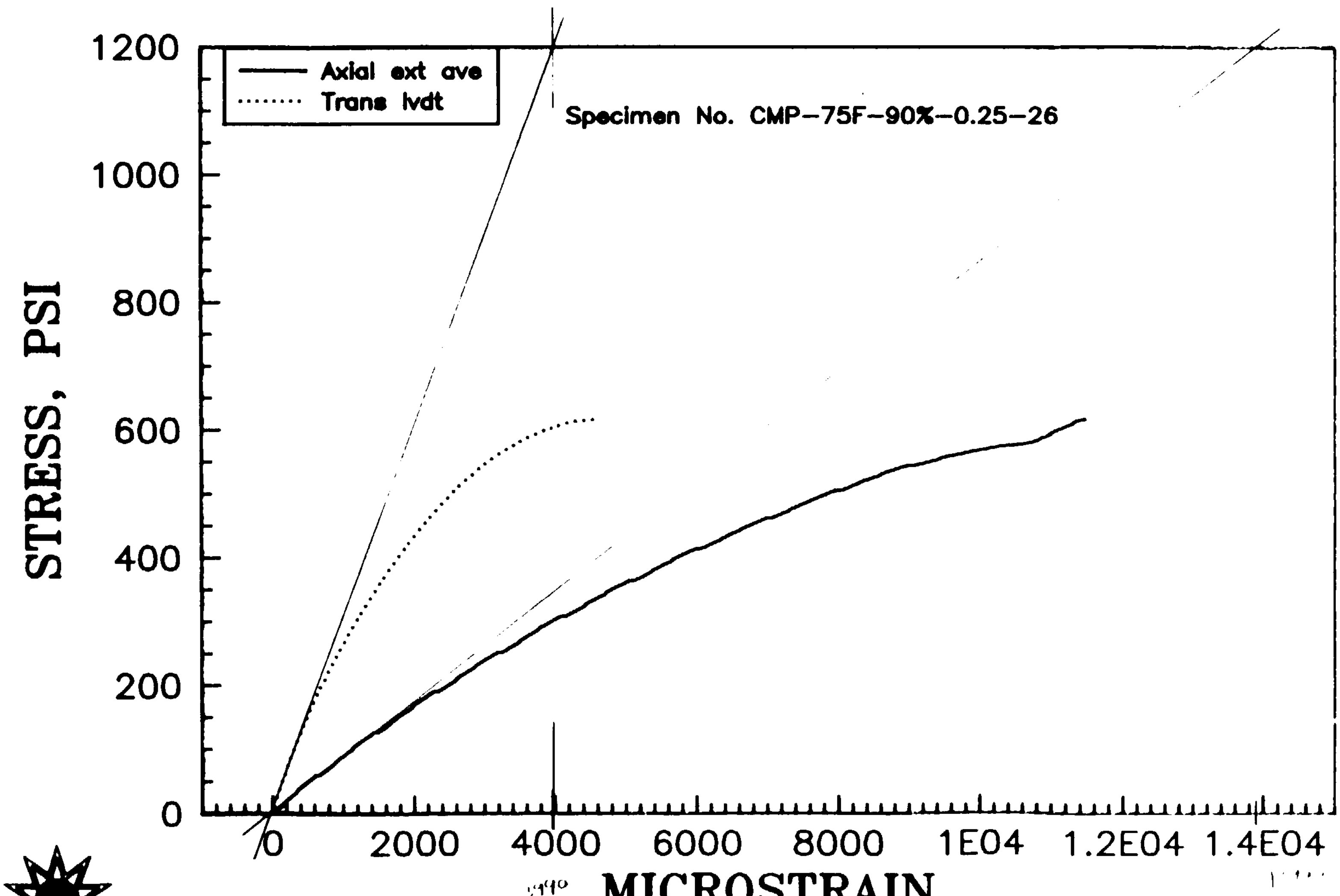
PVA/MB SOLUBLE CORE COMPRESSION TEST AGED AT 90°F, 90% RH



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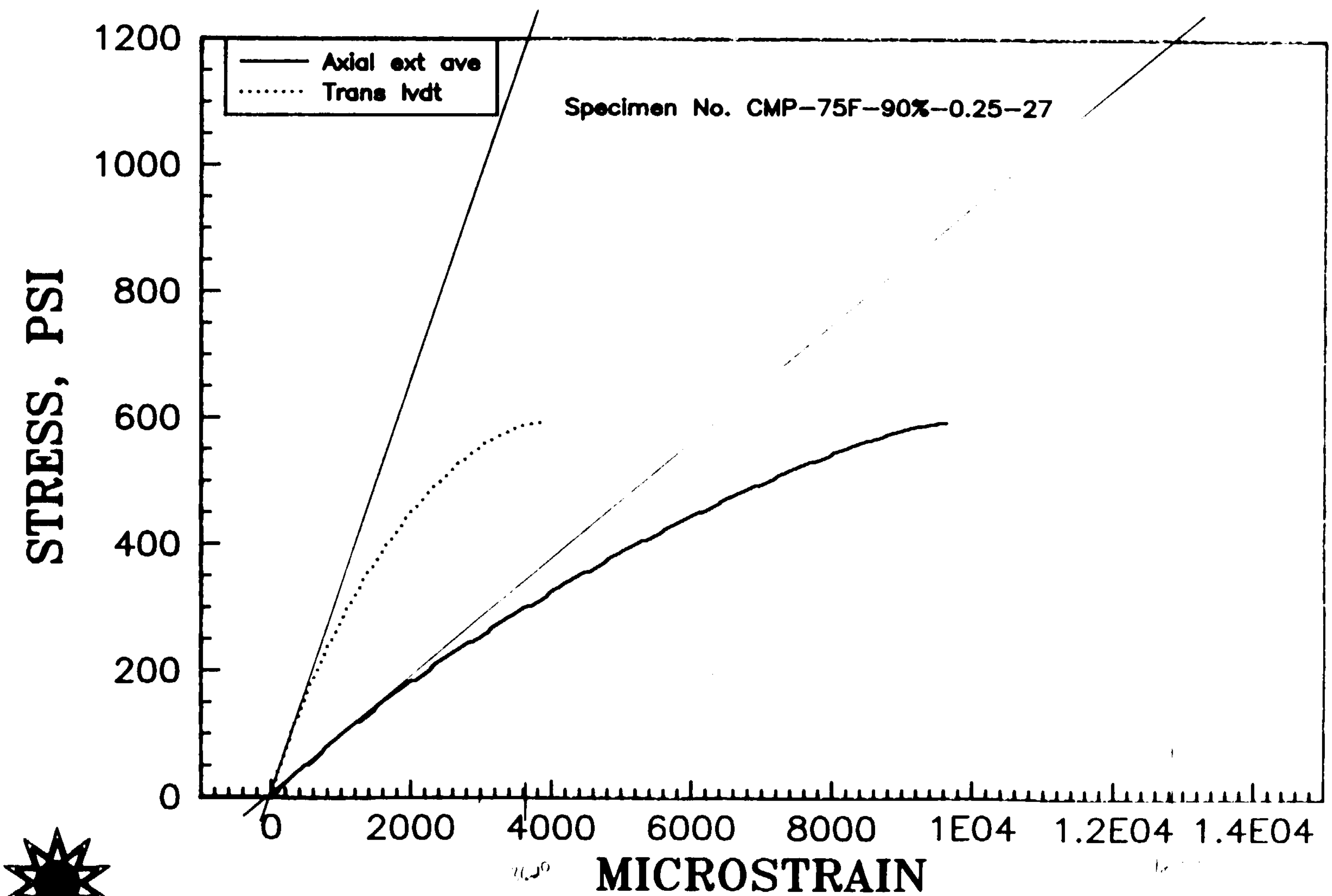
PVA/MB SOLUBLE CORE COMPRESSION TEST AGED AT 90°F, 90% RH



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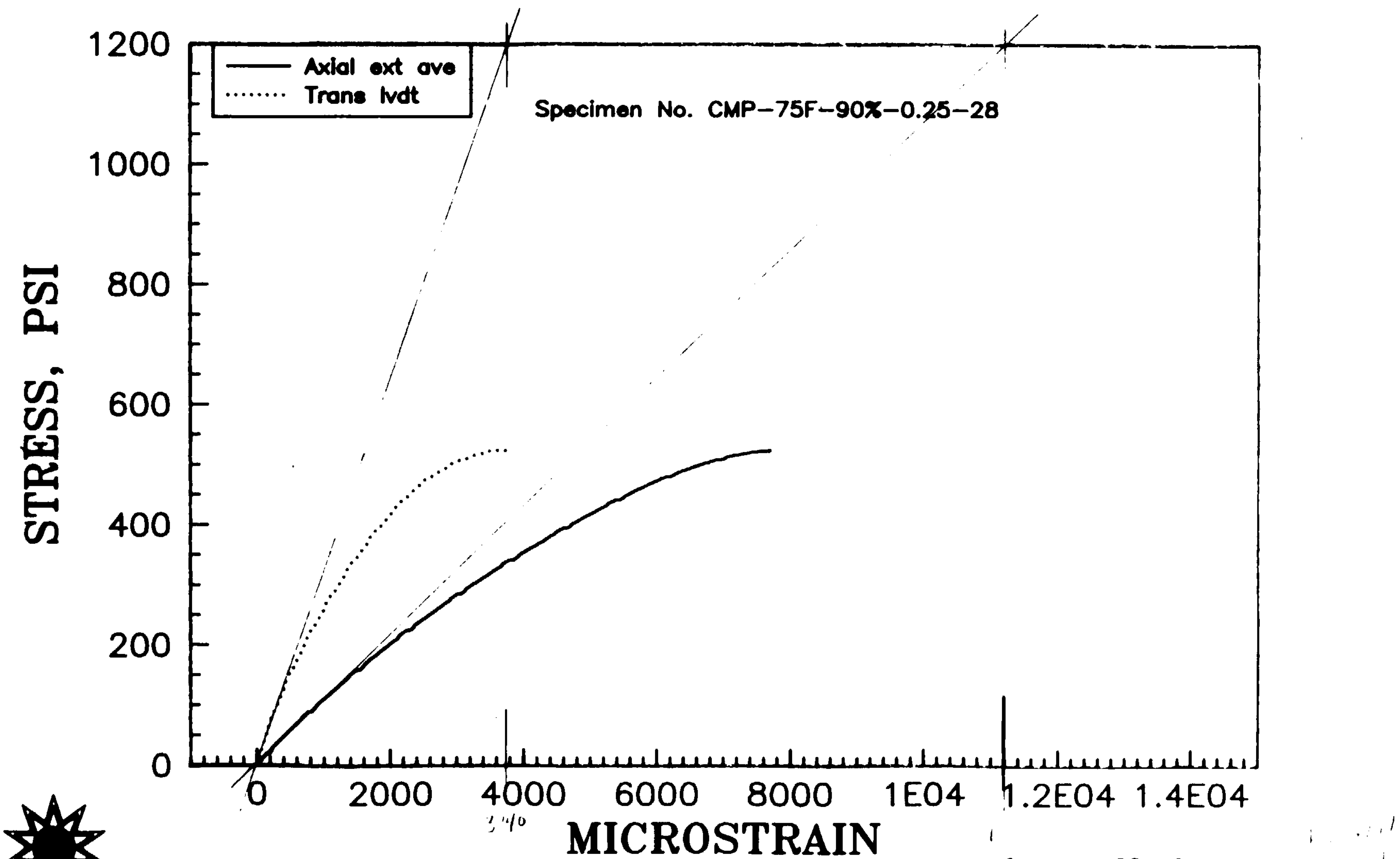
PVA/MB SOLUBLE CORE COMPRESSION TEST
AGED AT 90°F, 90% RH



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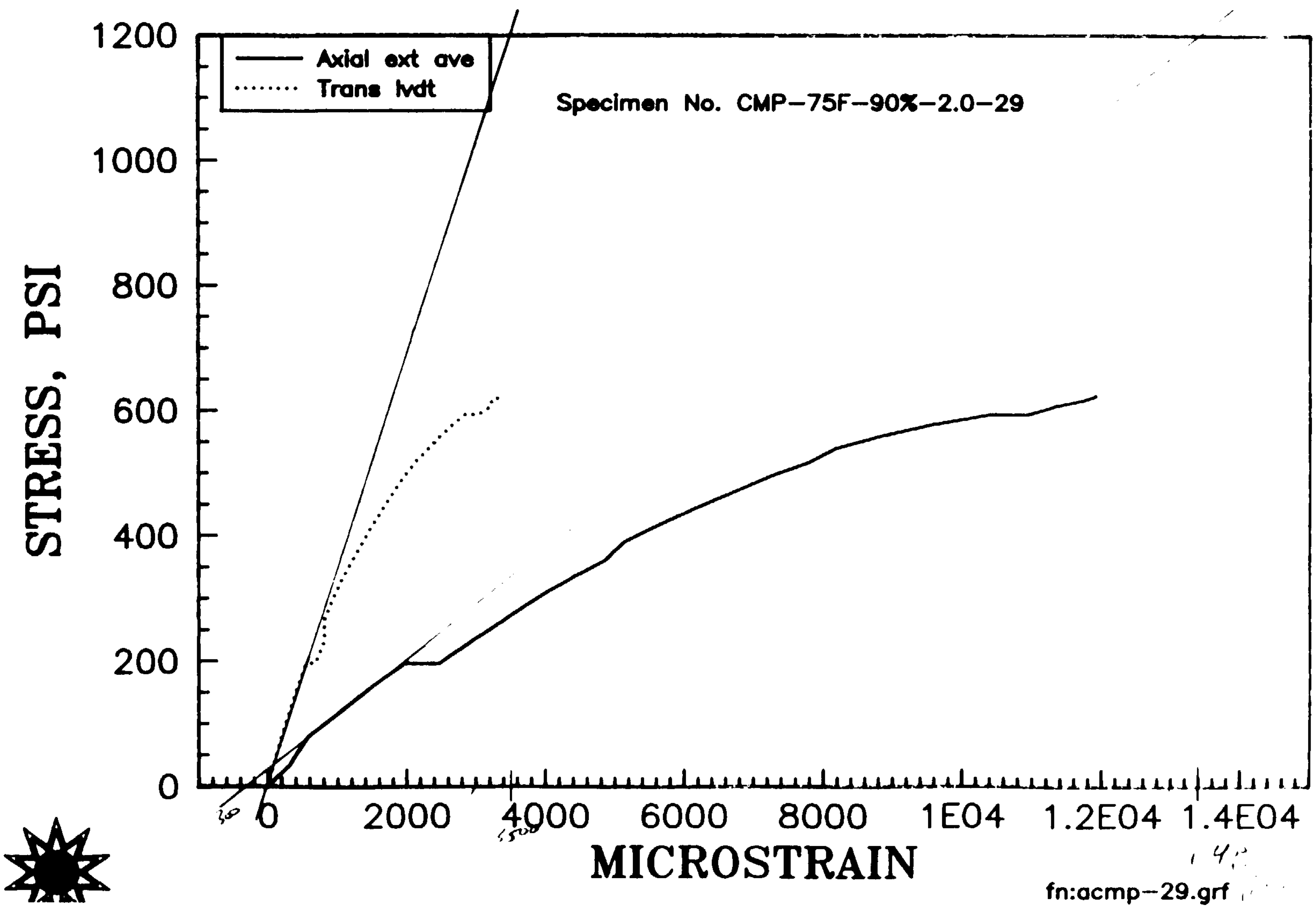
PVA/MB SOLUBLE CORE COMPRESSION TEST
AGED AT 90°F, 90% RH



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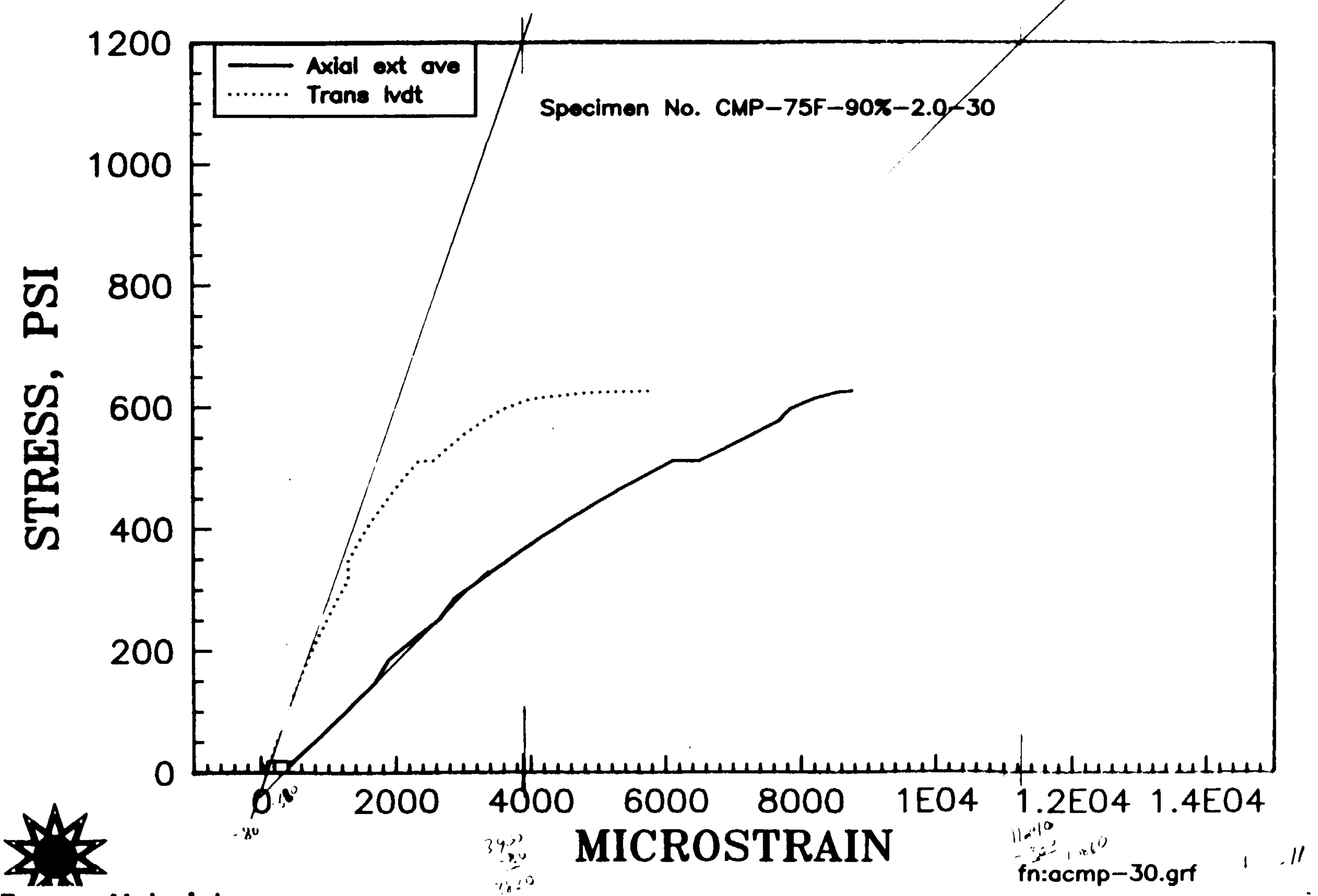
PVA/MB SOLUBLE CORE COMPRESSION TEST
AGED AT 90°F, 90% RH



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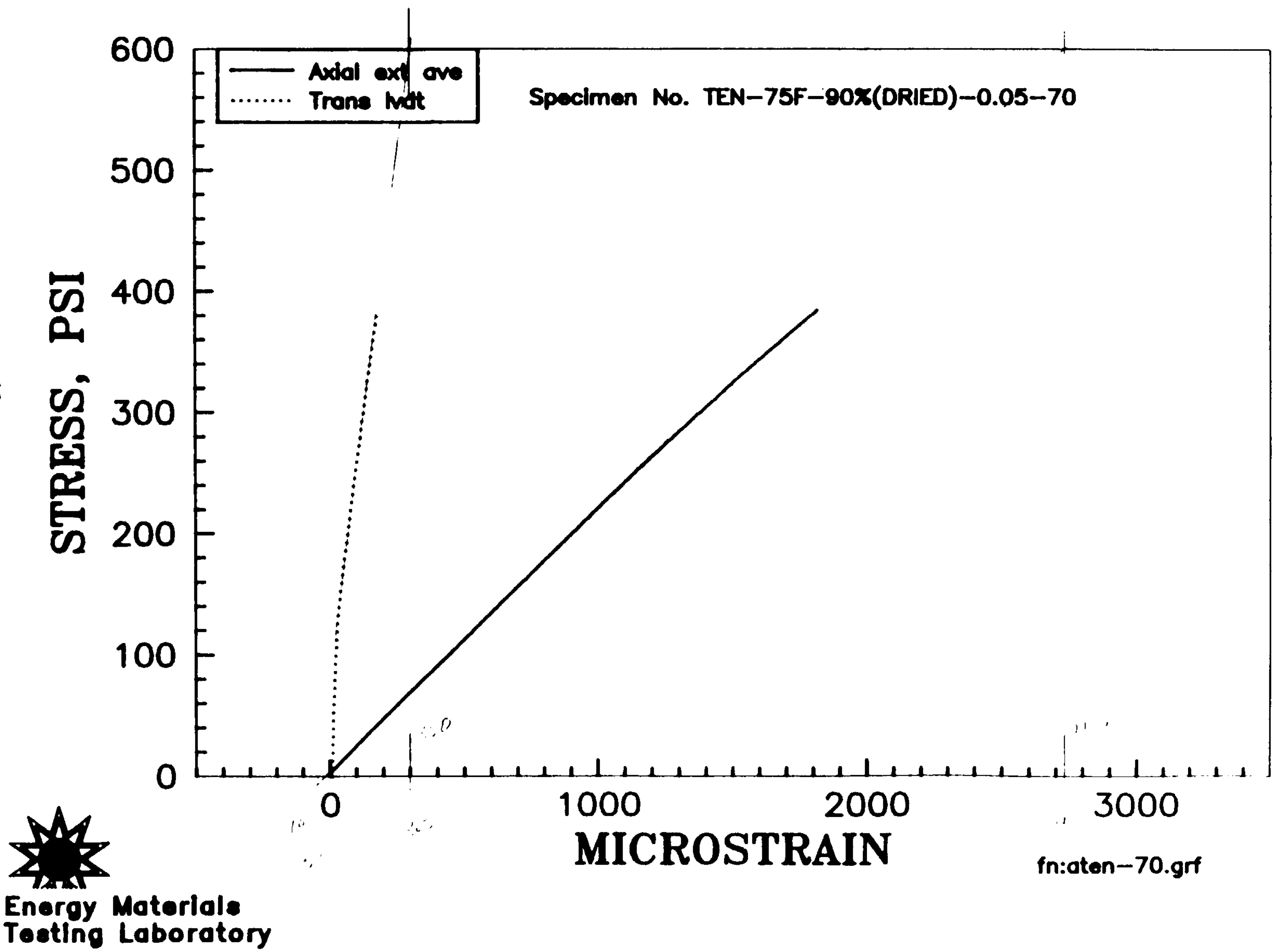
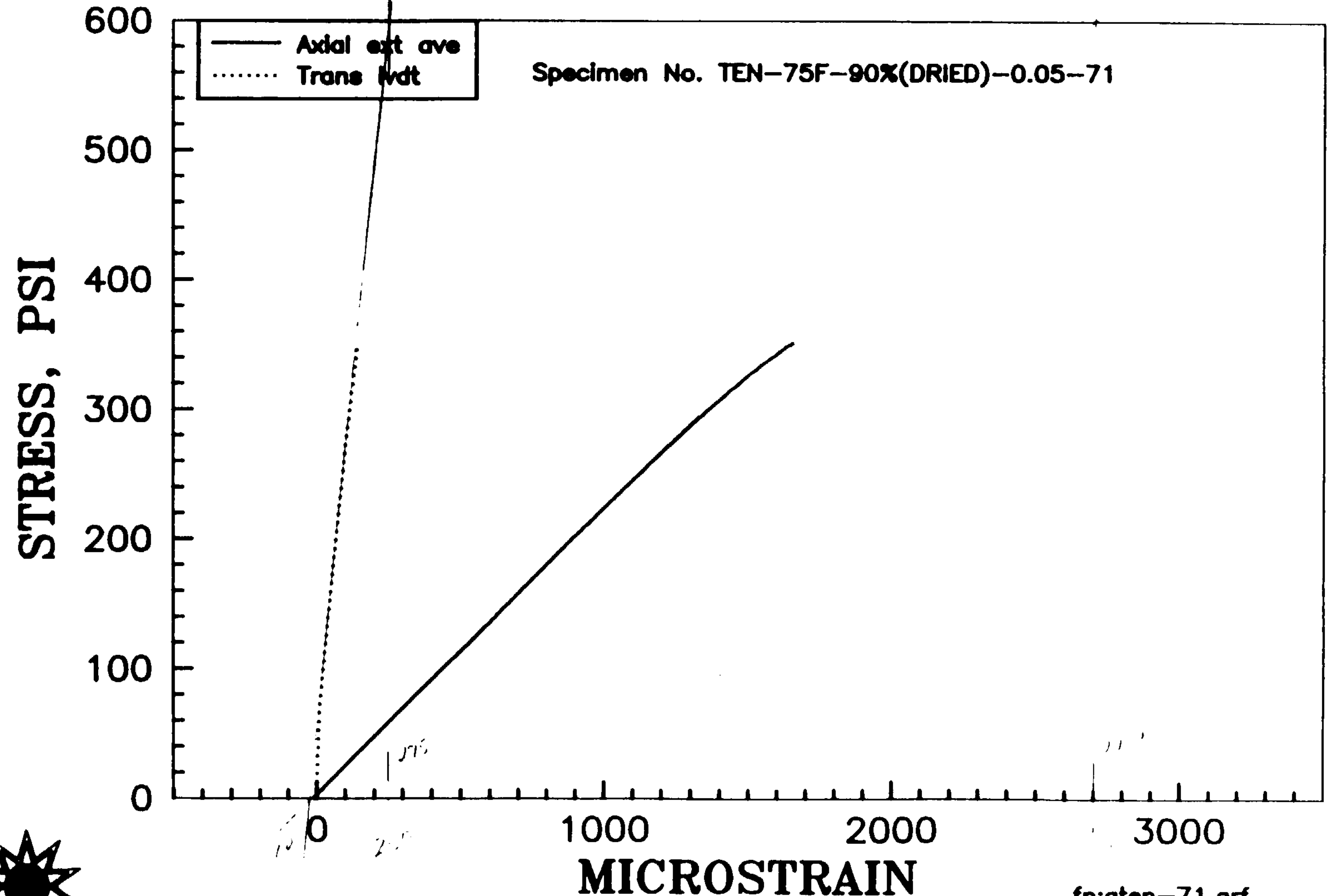
PVA/MB SOLUBLE CORE TENSION TEST
AGED AT 90°F, 90%RH; THEN DRIED AT 180°F



PVA/MB SOLUBLE CORE TENSION TEST
AGED AT 90°F, 90%RH; THEN DRIED AT 180°F



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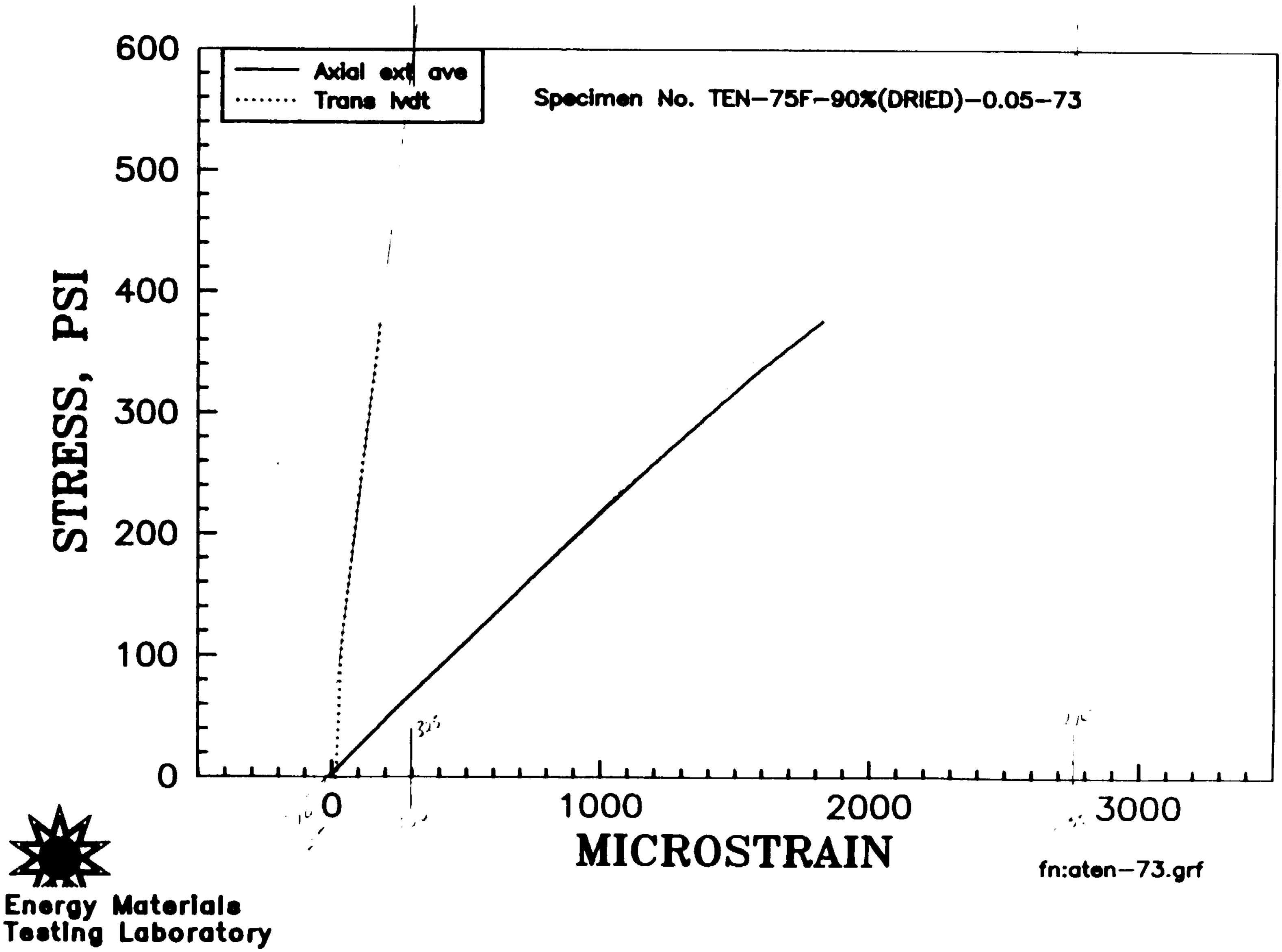
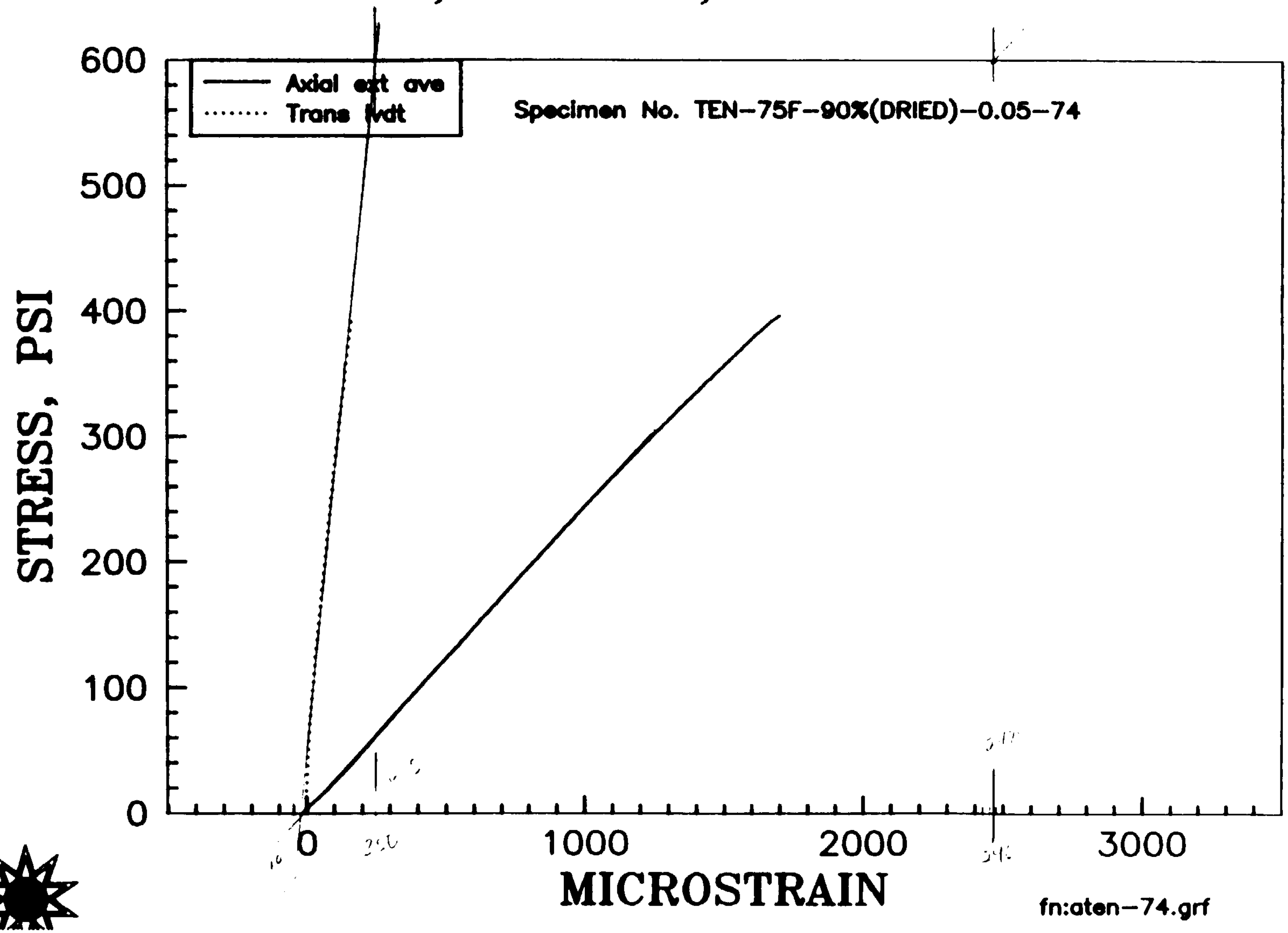
PVA/MB SOLUBLE CORE TENSION TEST
AGED AT 90°F, 90%RH; THEN DRIED AT 180°F



PVA/MB SOLUBLE CORE TENSION TEST
AGED AT 90°F, 90%RH; THEN DRIED AT 180°F



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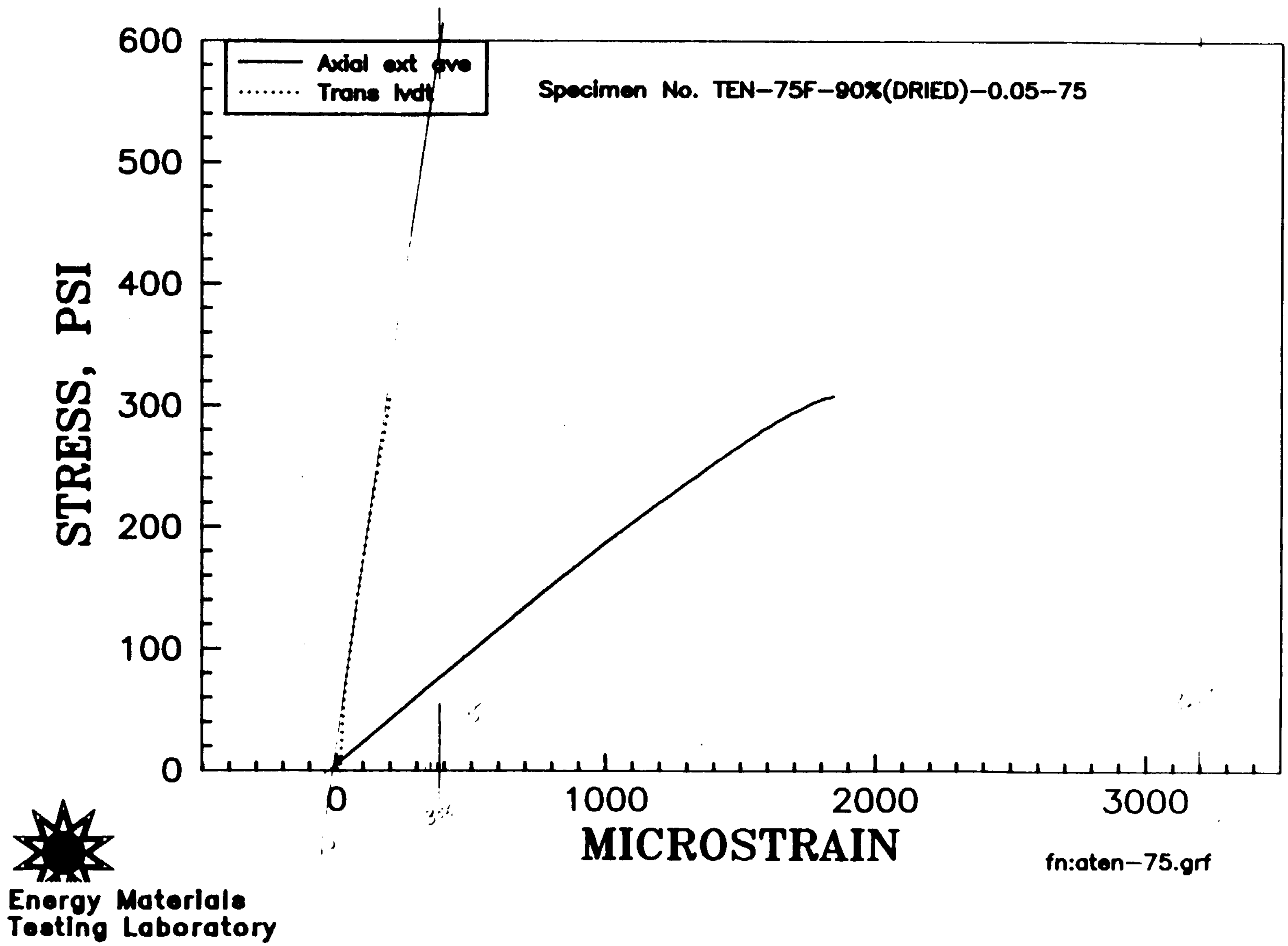
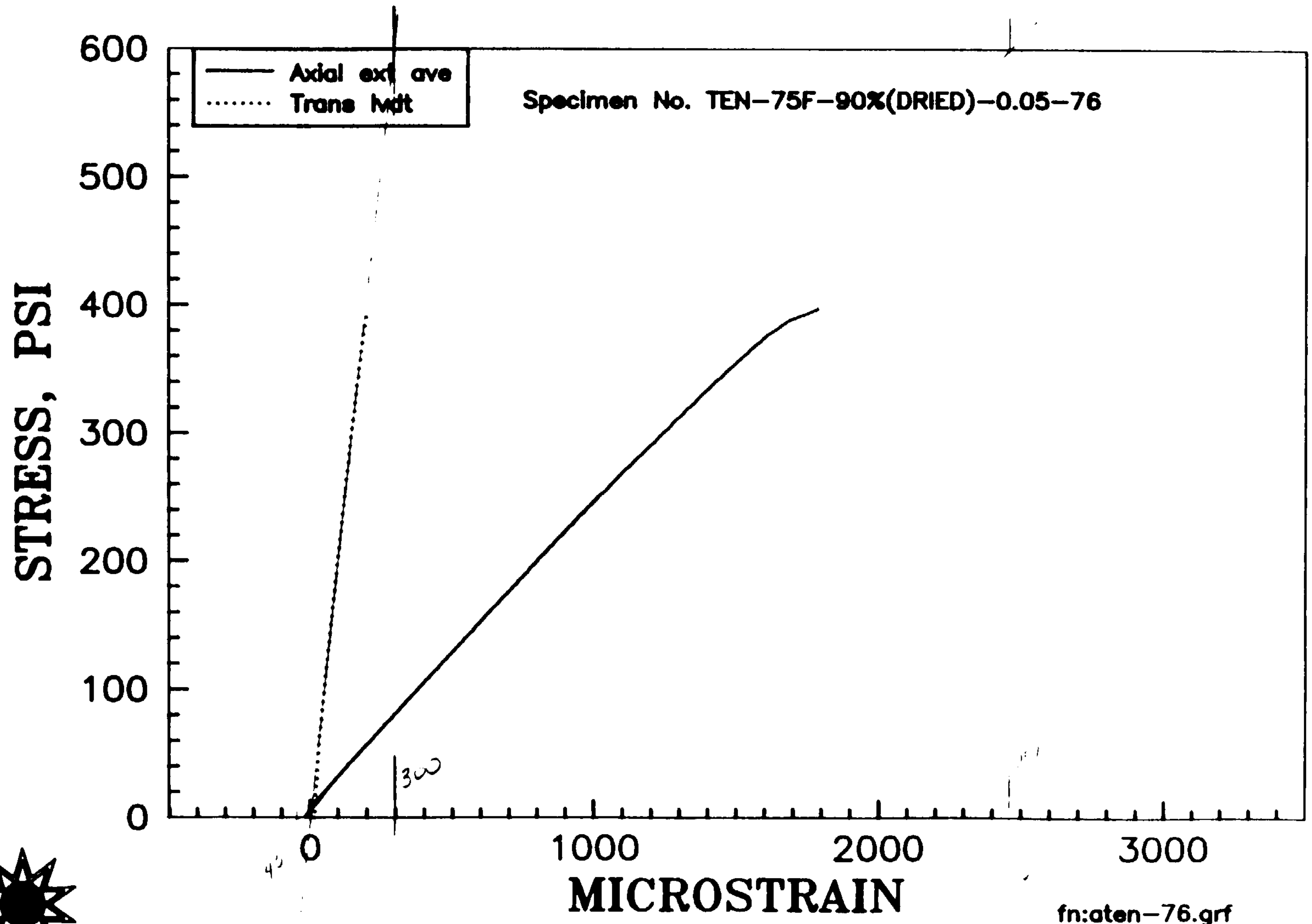
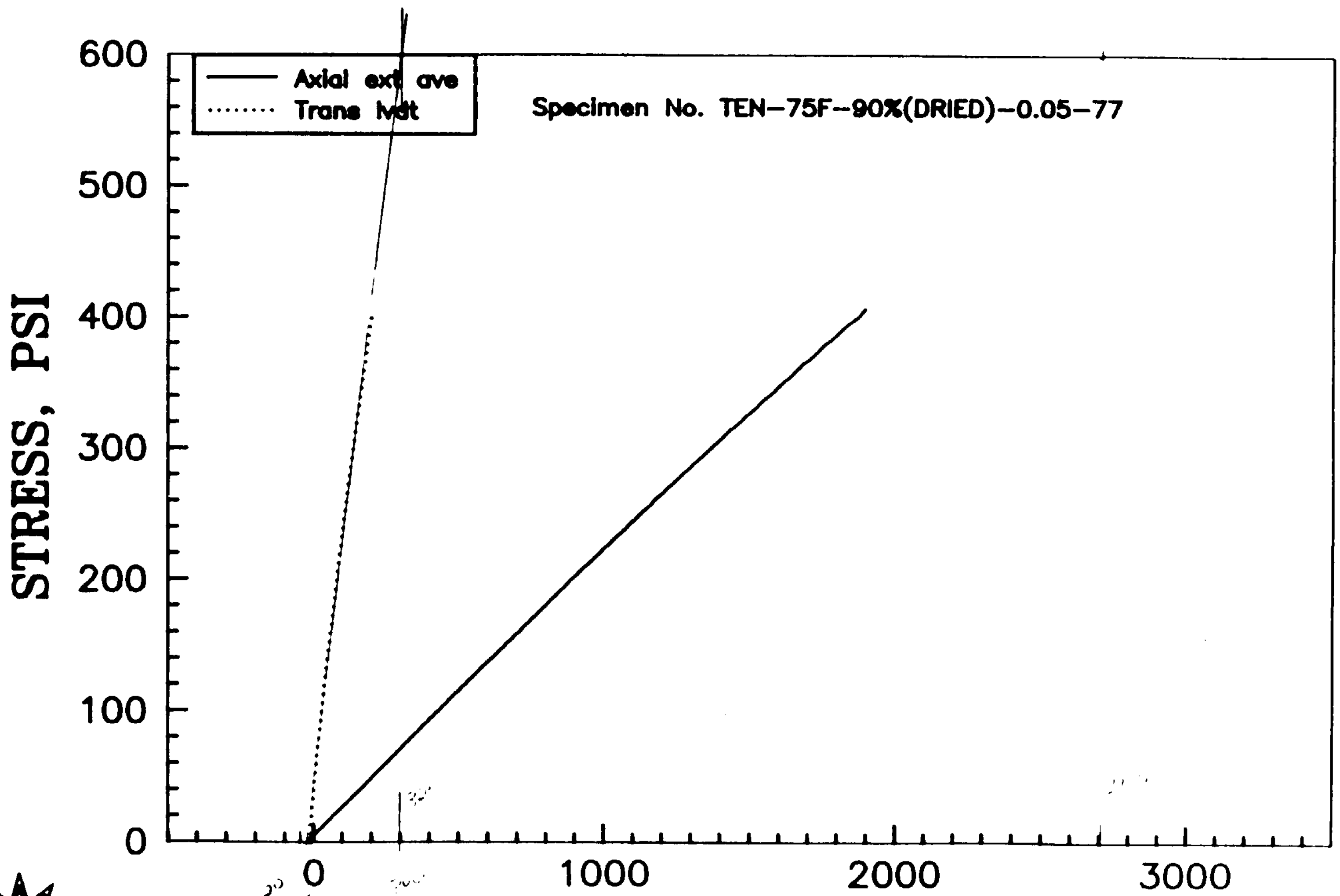
PVA/MB SOLUBLE CORE TENSION TEST
AGED AT 90°F, 90%RH; THEN DRIED AT 180°F



PVA/MB SOLUBLE CORE TENSION TEST
AGED AT 90°F, 90%RH; THEN DRIED AT 180°F



PVA/MB SOLUBLE CORE TENSION TEST AGED AT 90°F, 90%RH; THEN DRIED AT 180°F



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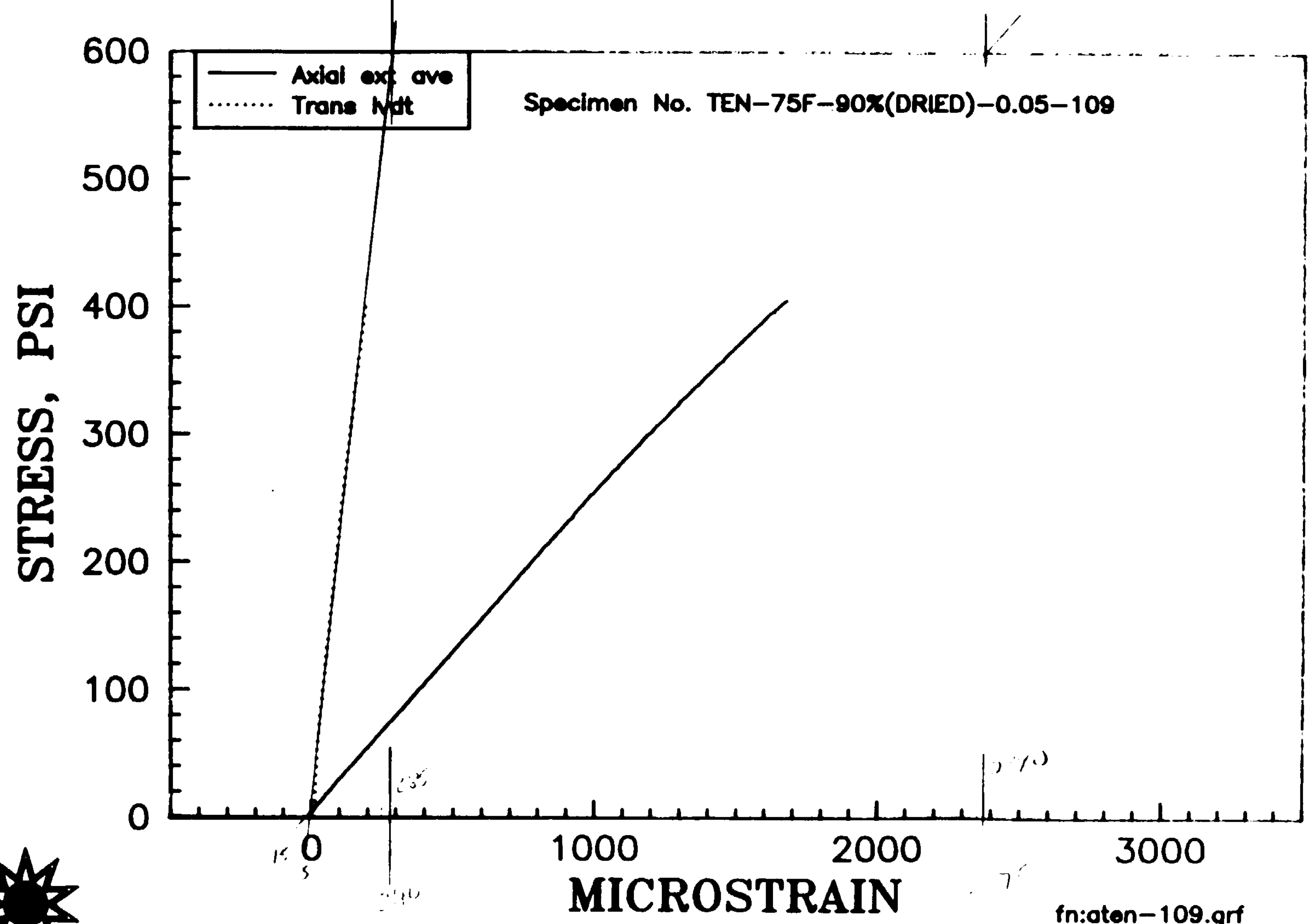
PVA/MB SOLUBLE CORE TENSION TEST
AGED AT 90°F, 90%RH; THEN DRIED AT 180°F



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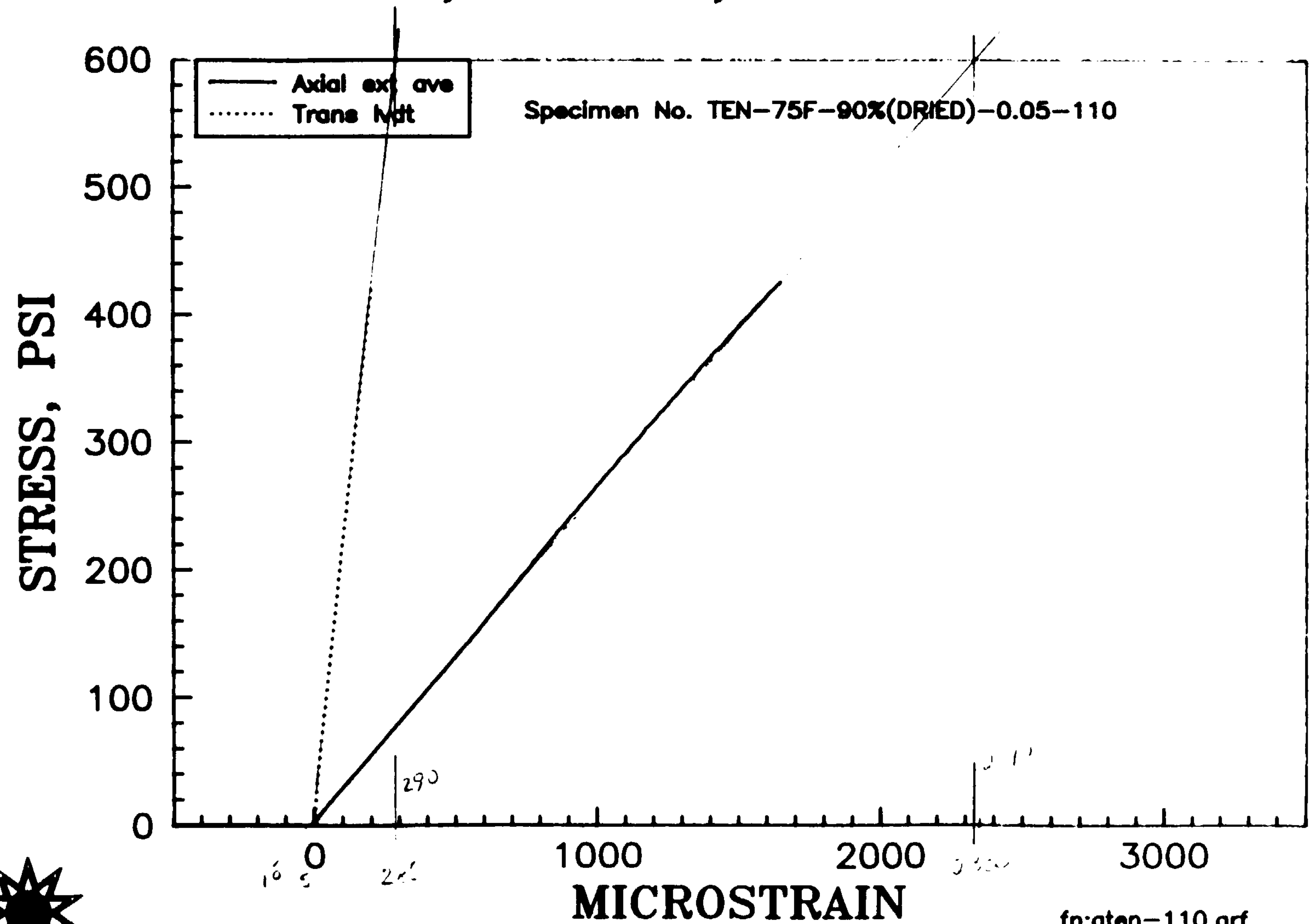
PVA/MB SOLUBLE CORE TENSION TEST
AGED AT 90°F, 90%RH; THEN DRIED AT 180°F



Energy Materials
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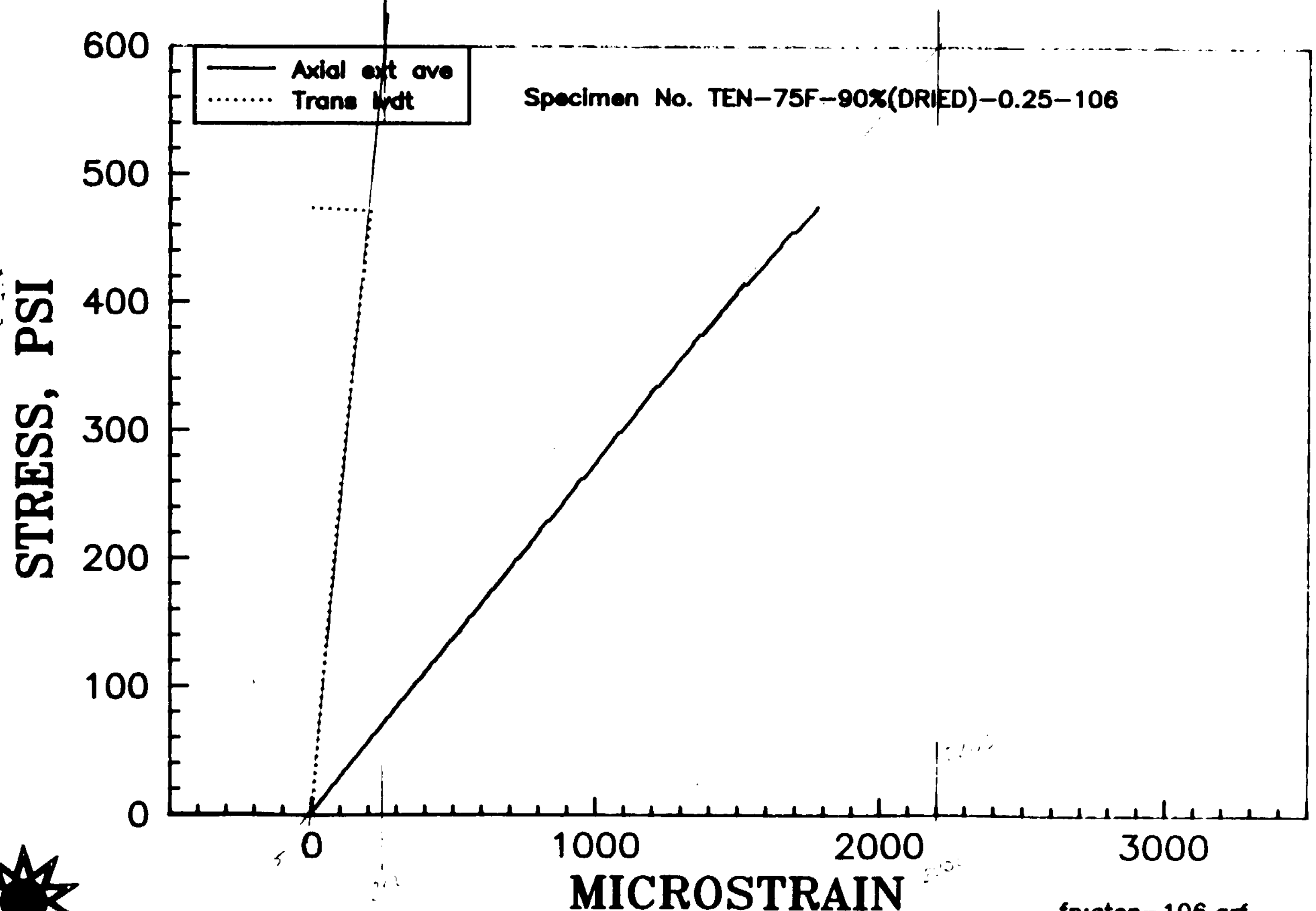
PVA/MB SOLUBLE CORE TENSION TEST
AGED AT 90°F, 90%RH; THEN DRIED AT 180°F



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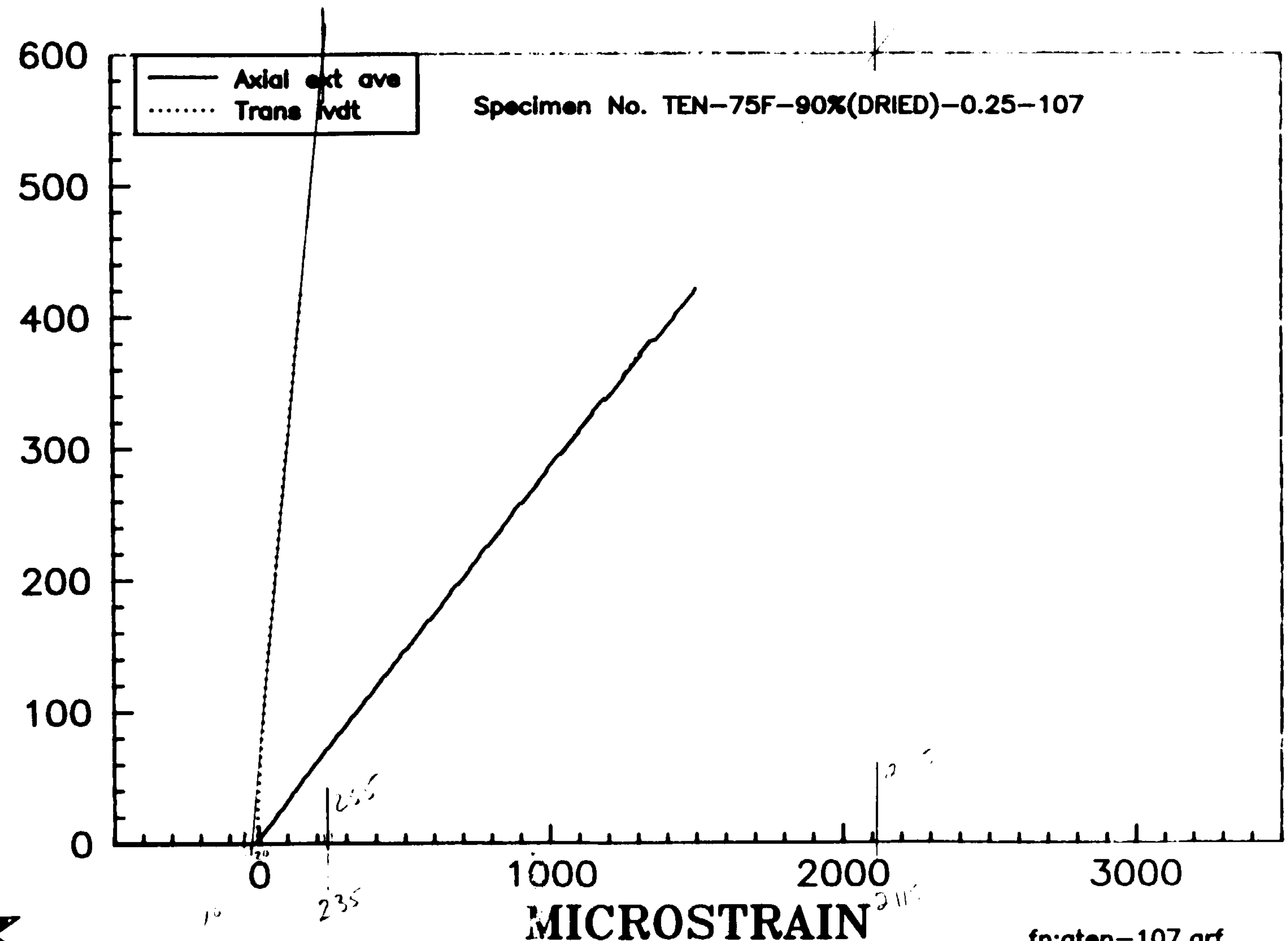
PVA/MB SOLUBLE CORE TENSION TEST
AGED AT 90°F, 90%RH; THEN DRIED AT 180°F



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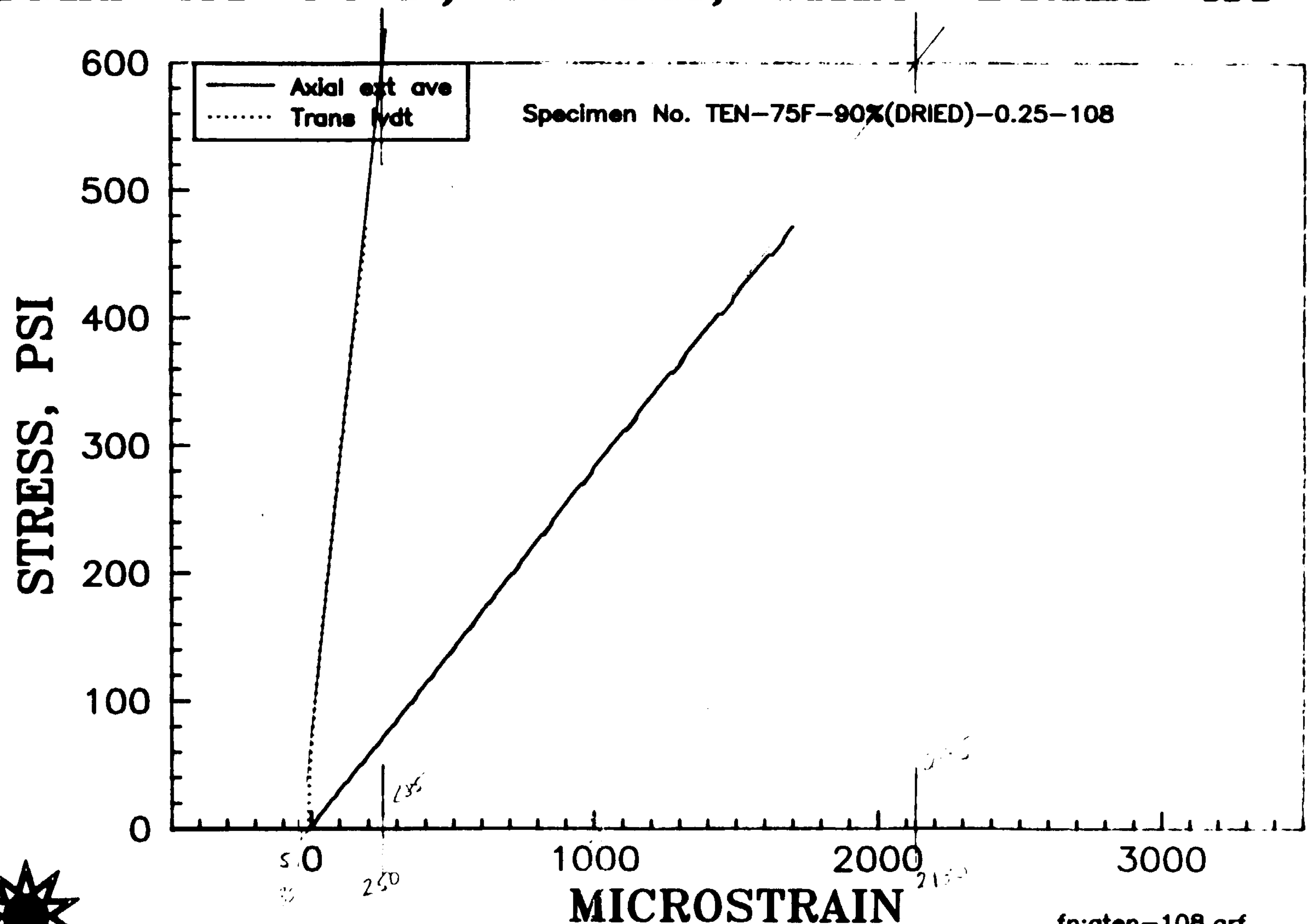
PVA/MB SOLUBLE CORE TENSION TEST
AGED AT 90°F, 90%RH; THEN DRIED AT 180°F



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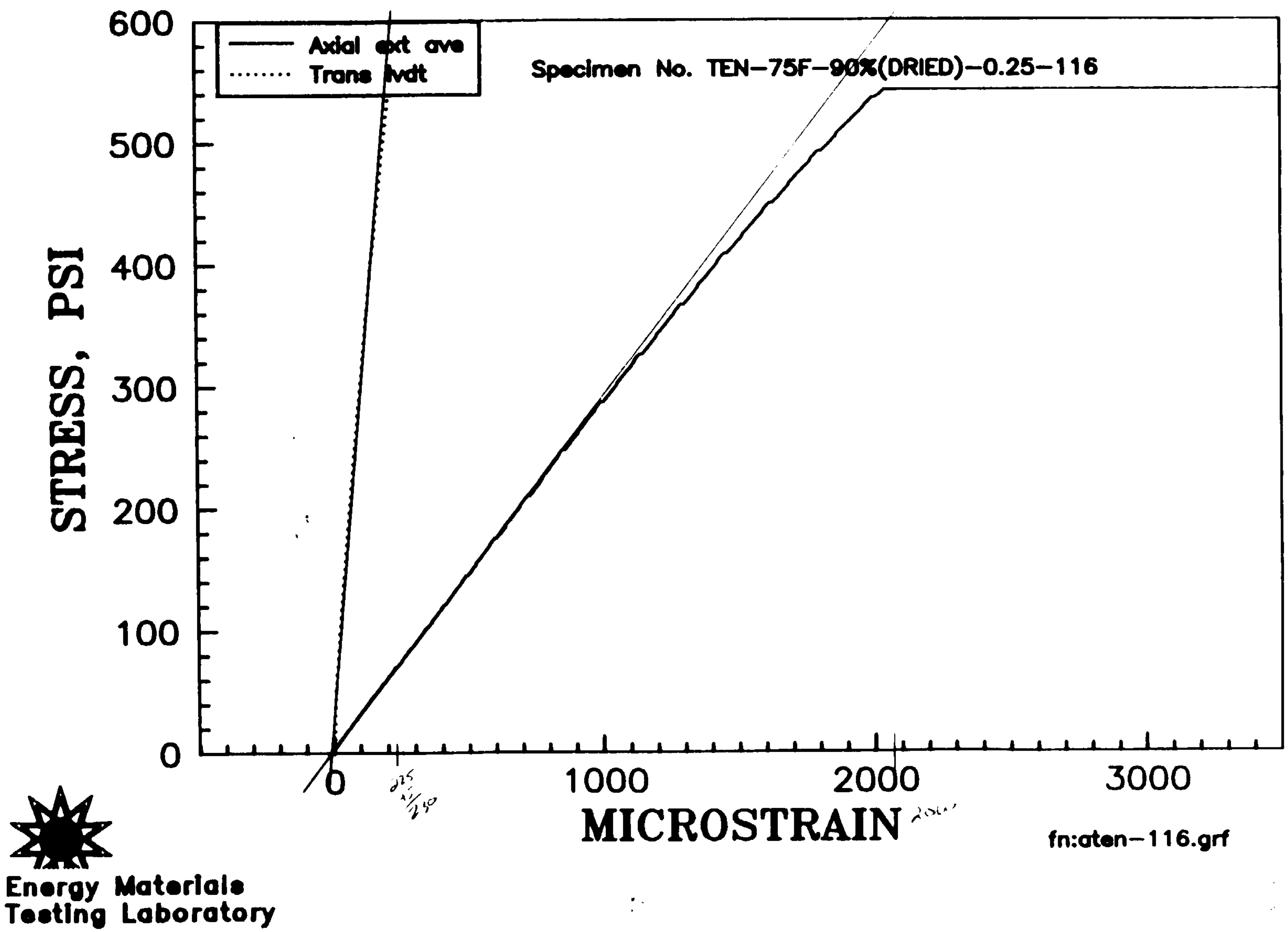
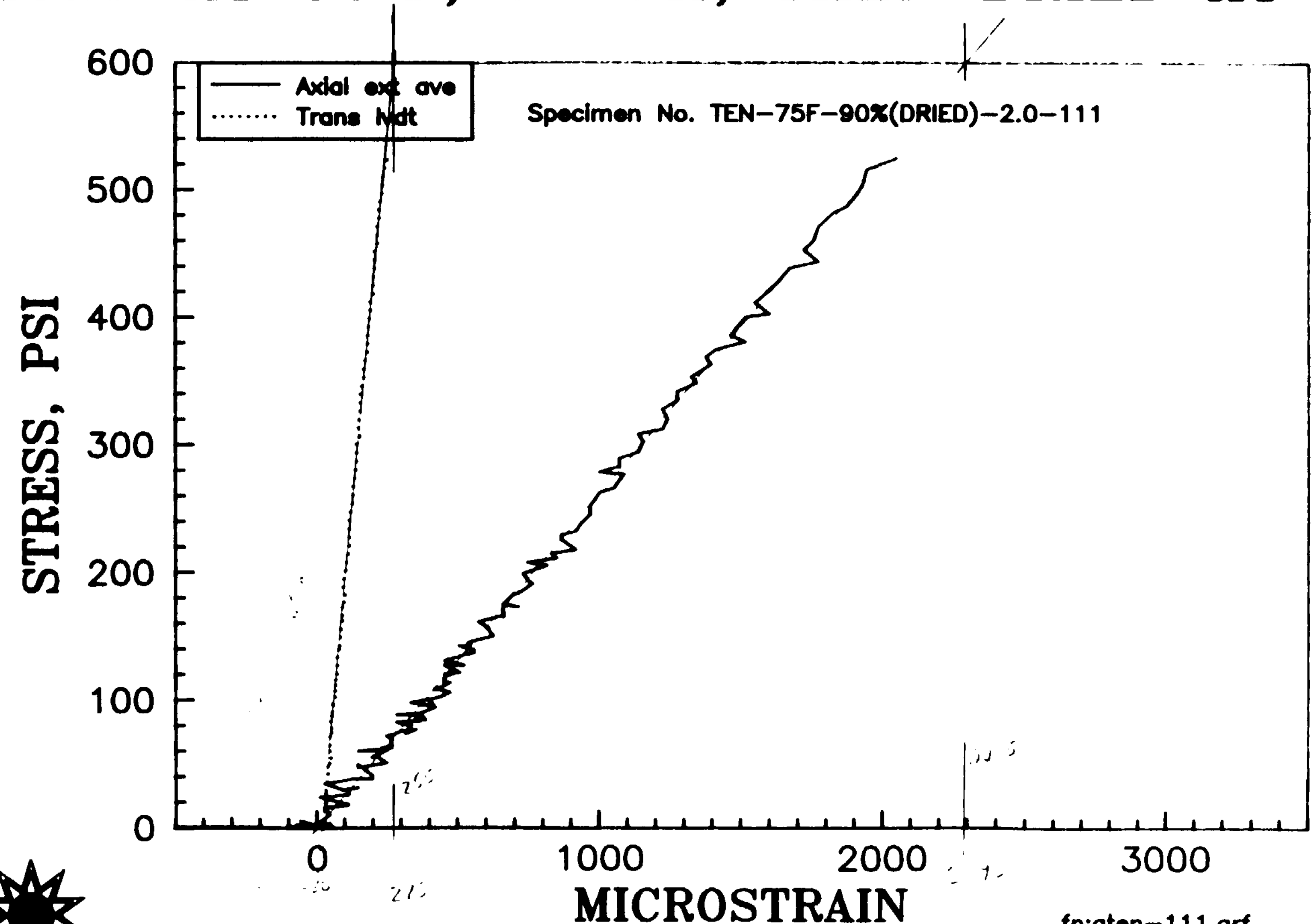
PVA/MB SOLUBLE CORE TENSION TEST
AGED AT 90°F, 90%RH; THEN DRIED AT 180°F



PVA/MB SOLUBLE CORE TENSION TEST
AGED AT 90°F, 90%RH; THEN DRIED AT 180°F



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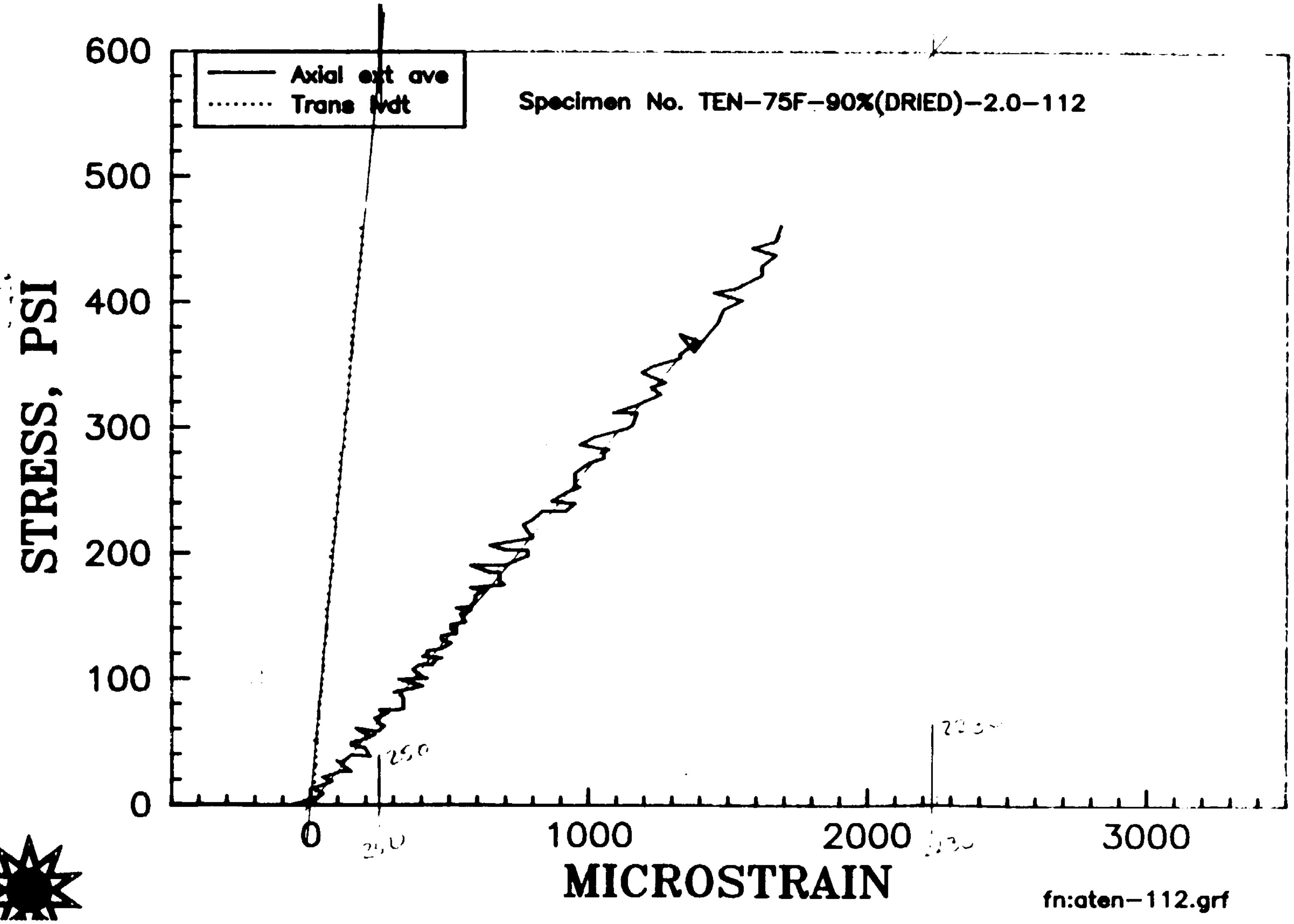
PVA/MB SOLUBLE CORE TENSION TEST
AGED AT 90°F, 90%RH; THEN DRIED AT 180°F



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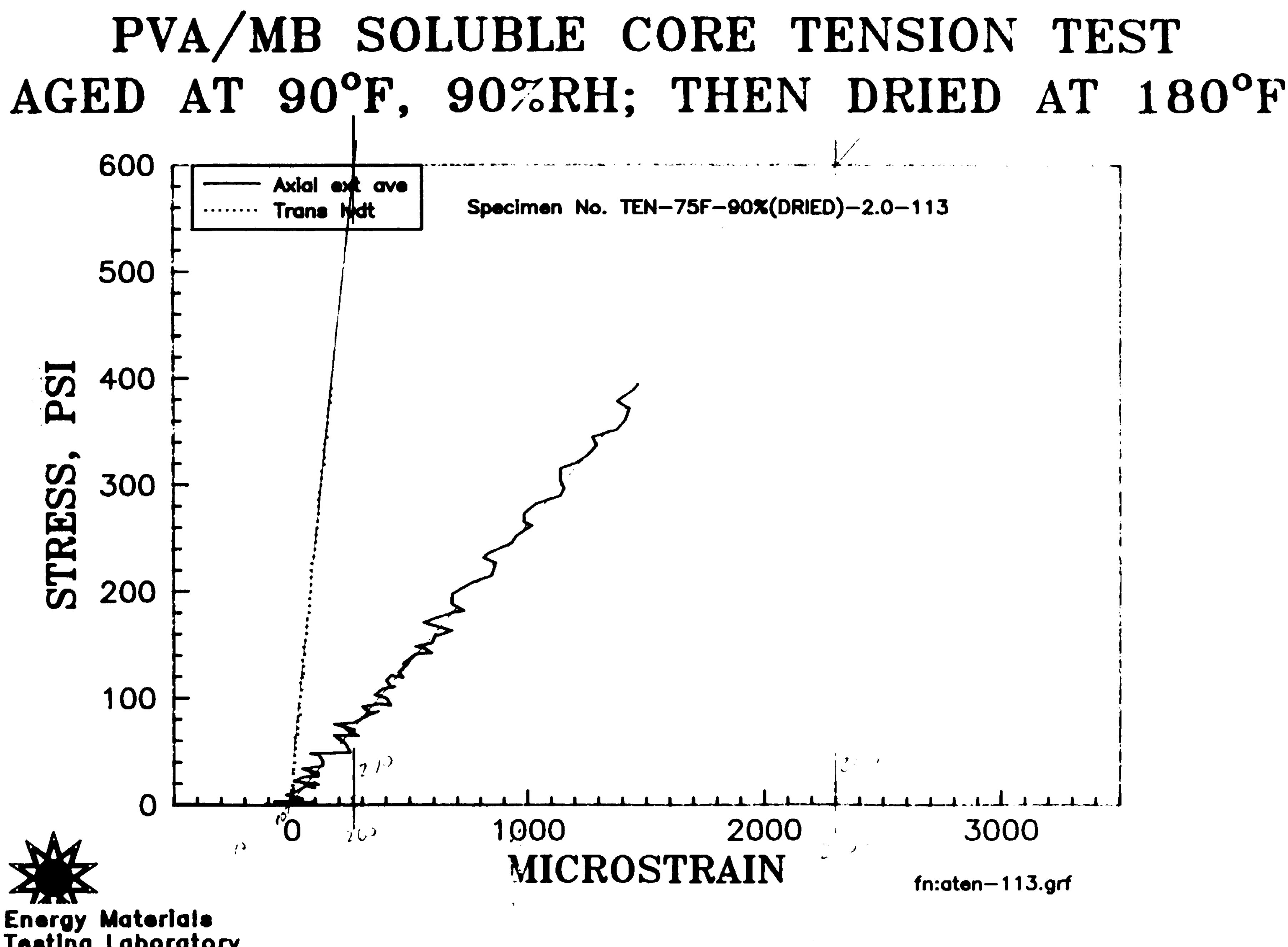
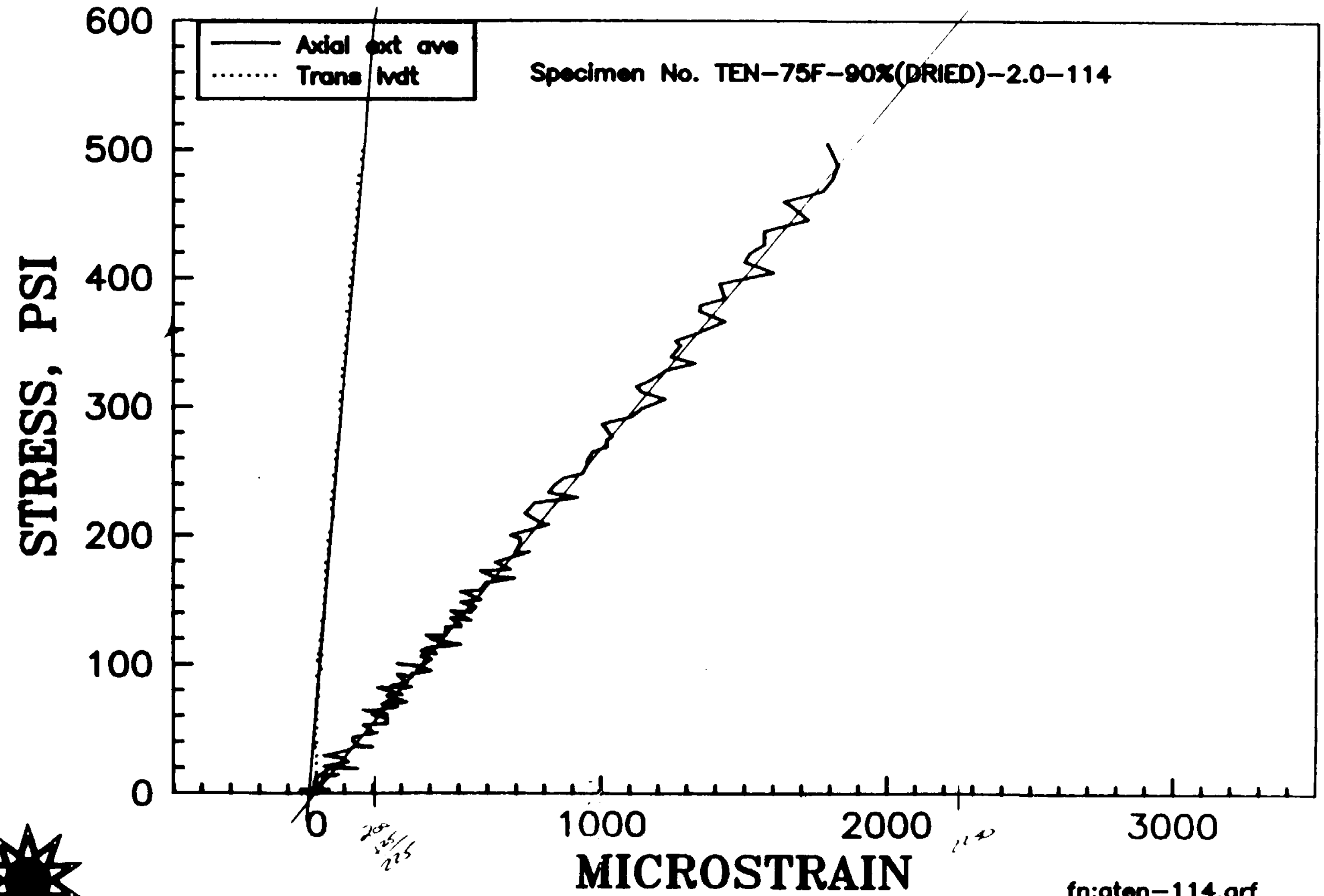
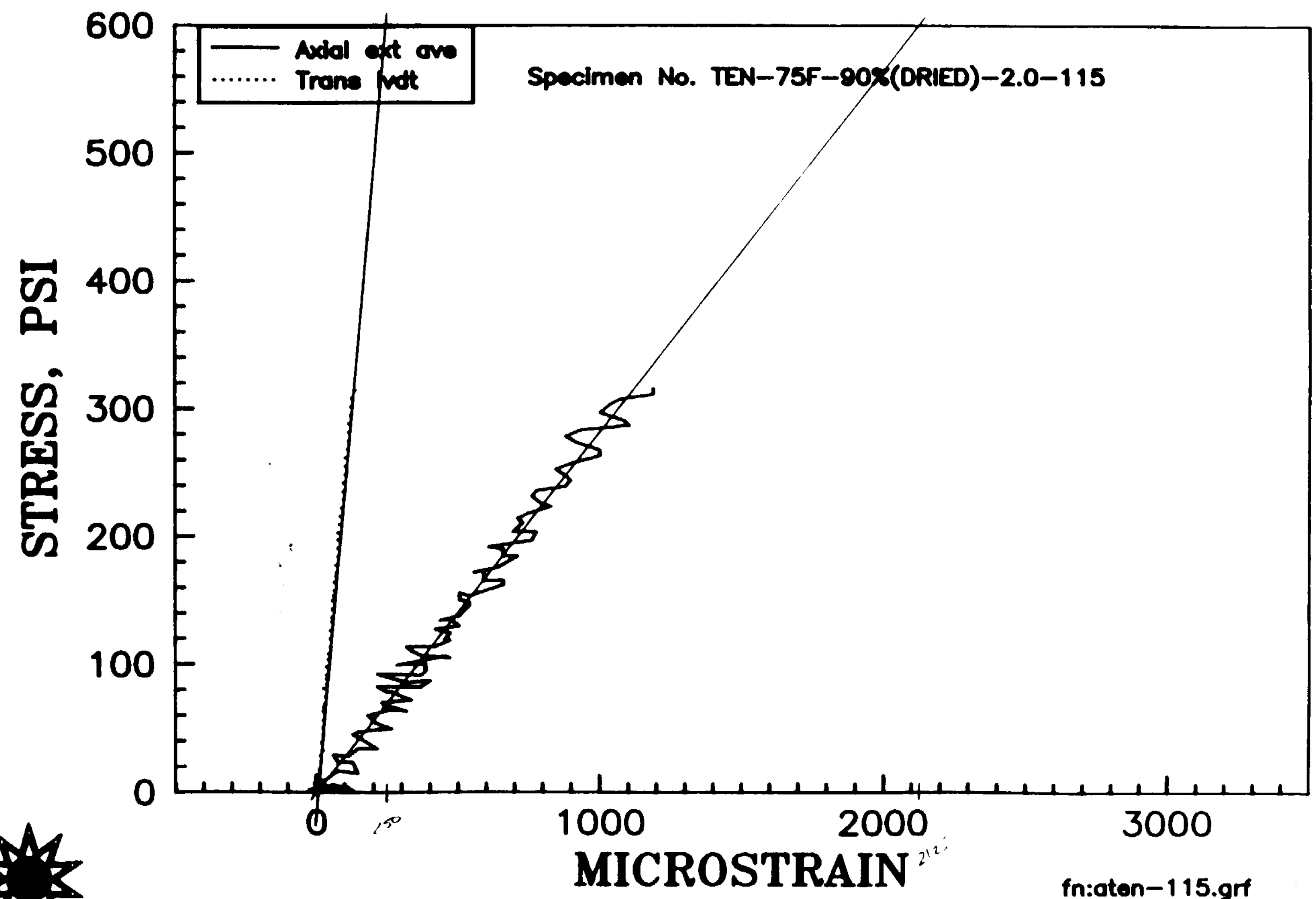

PVA/MB SOLUBLE CORE TENSION TEST
AGED AT 90°F, 90%RH; THEN DRIED AT 180°F
Axial ext ave
Trans Hdt
Specimen No. TEN-75F-90%(DRIED)-2.0-113
STRESS, PSI
600
500
400
300
200
100
0
0
1000
2000
3000
MICROSTRAIN
fn:aten-113.grf
Energy Materials
Testing Laboratory

PVA/MB SOLUBLE CORE TENSION TEST
AGED AT 90°F, 90%RH; THEN DRIED AT 180°F



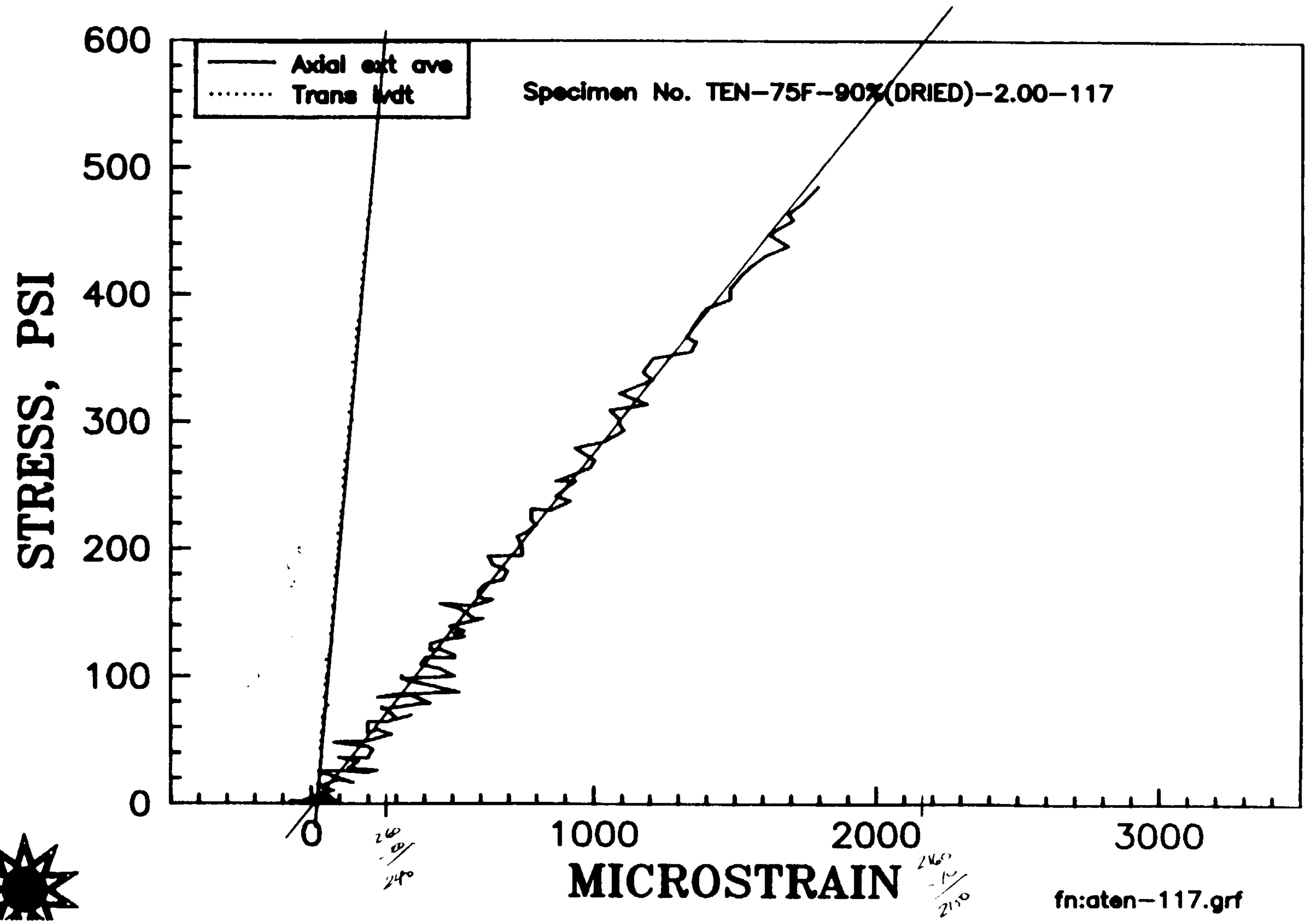
Energy Materials
Testing Laboratory

PVA/MB SOLUBLE CORE TENSION TEST
AGED AT 90°F, 90%RH; THEN DRIED AT 180°F



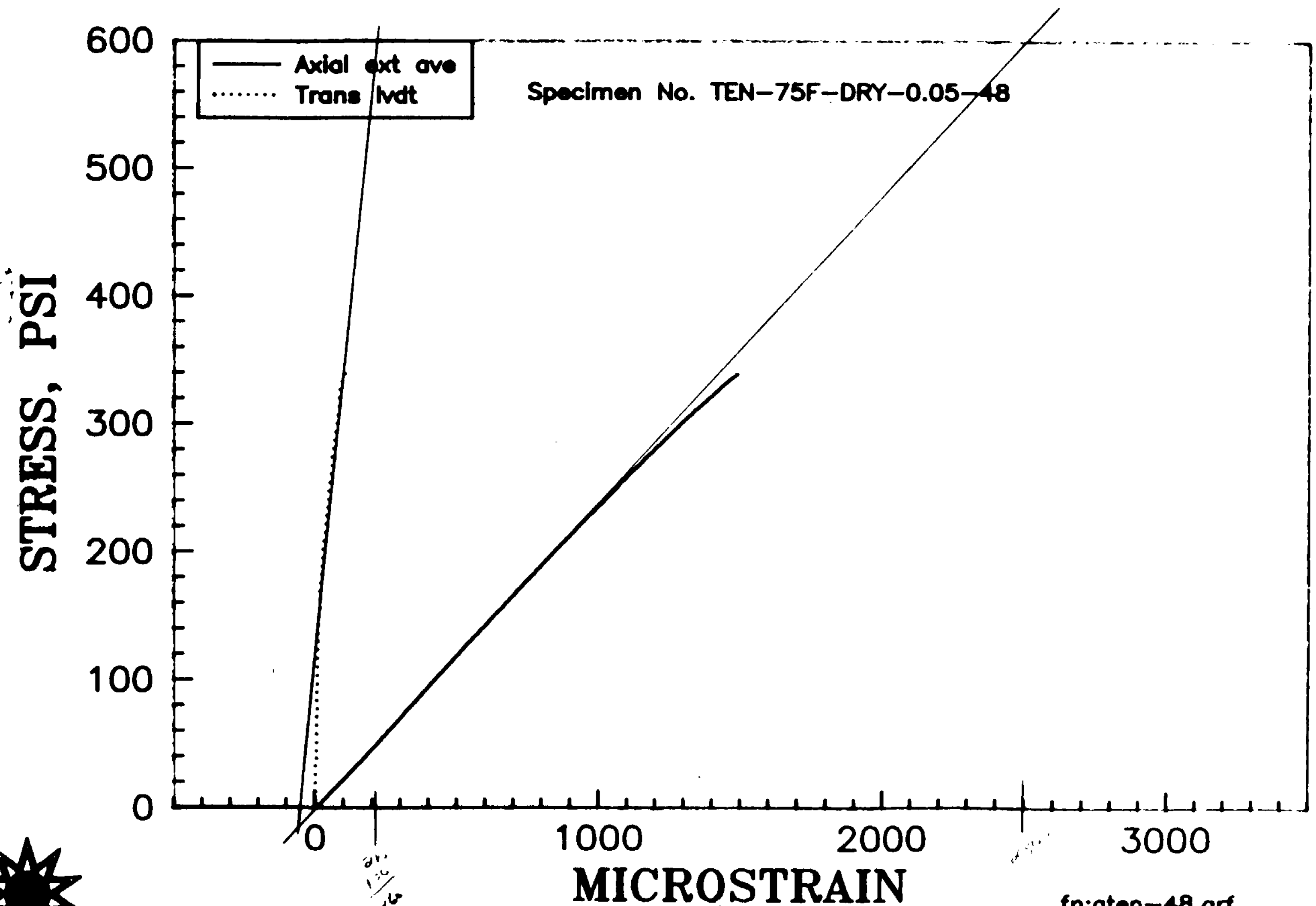
Energy Materials Testing Laboratory

PVA/MB SOLUBLE CORE TENSION TEST
AGED AT 90°F, 90%RH; THEN DRIED AT 180°F



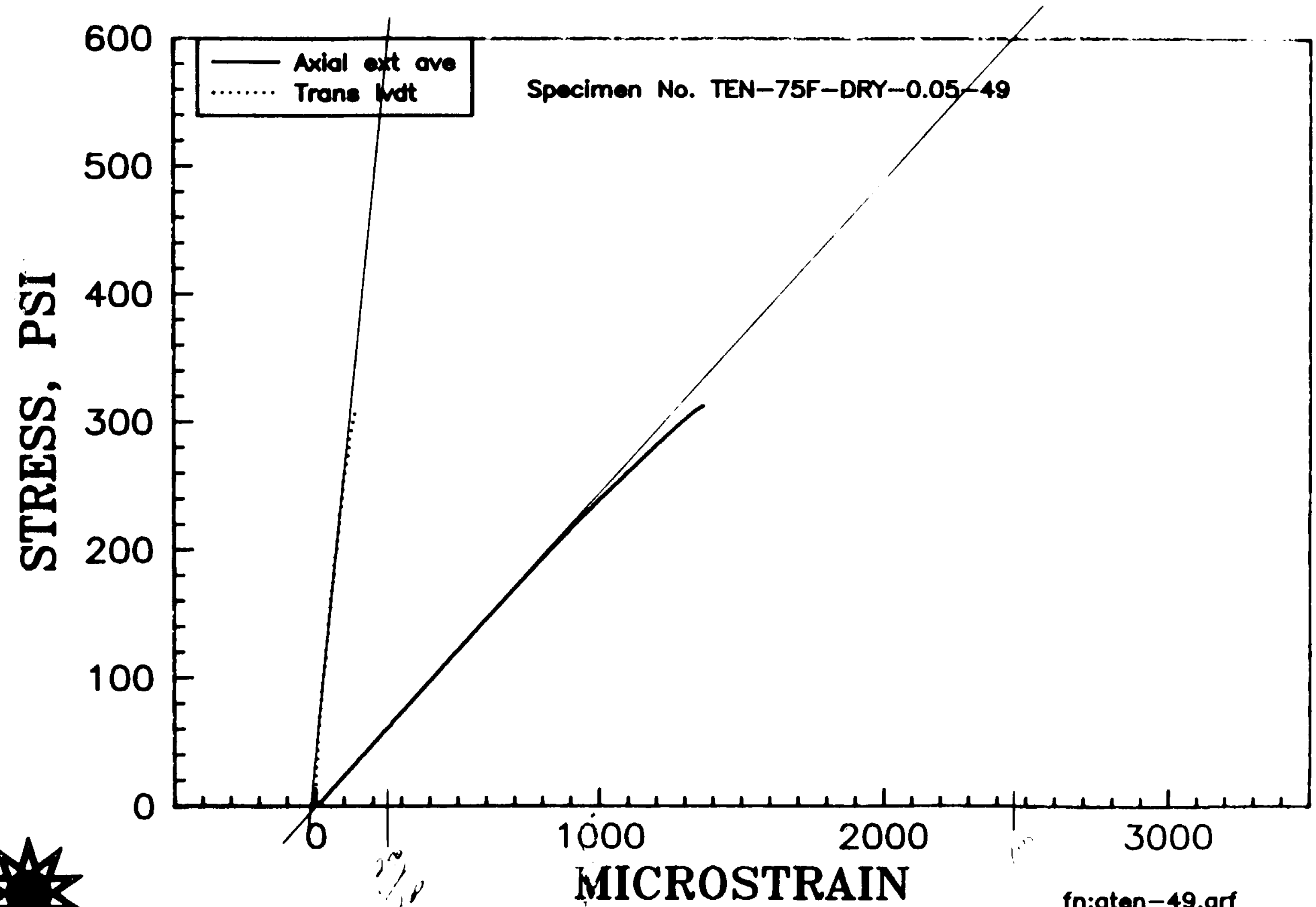
Energy Materials
Testing Laboratory

PVA/MB SOLUBLE CORE TENSION TEST
BASELINE SAMPLES; NO HIGH HUMIDITY AGING



Energy Materials
Testing Laboratory

PVA/MB SOLUBLE CORE TENSION TEST
BASELINE SAMPLES; NO HIGH HUMIDITY AGING



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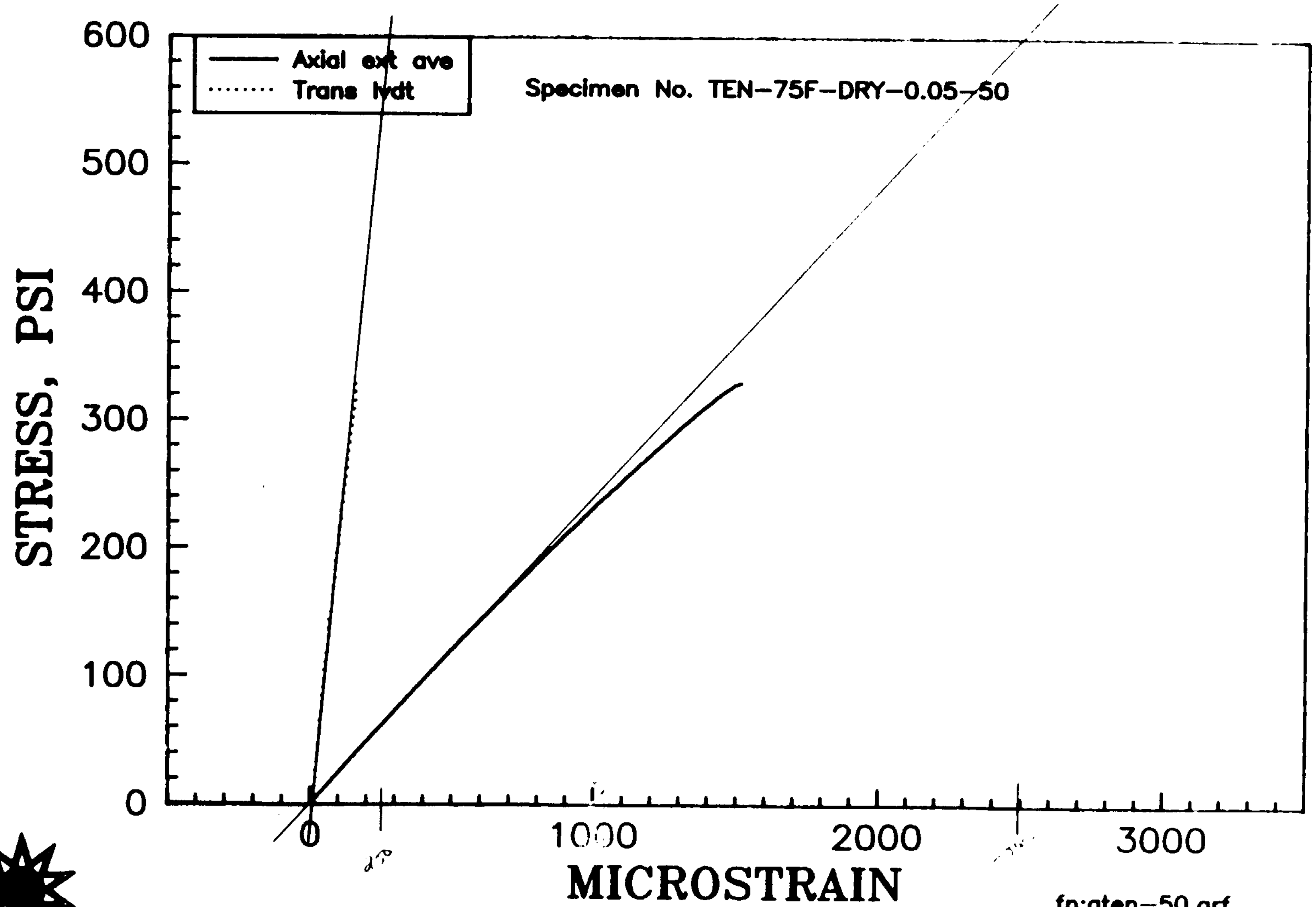
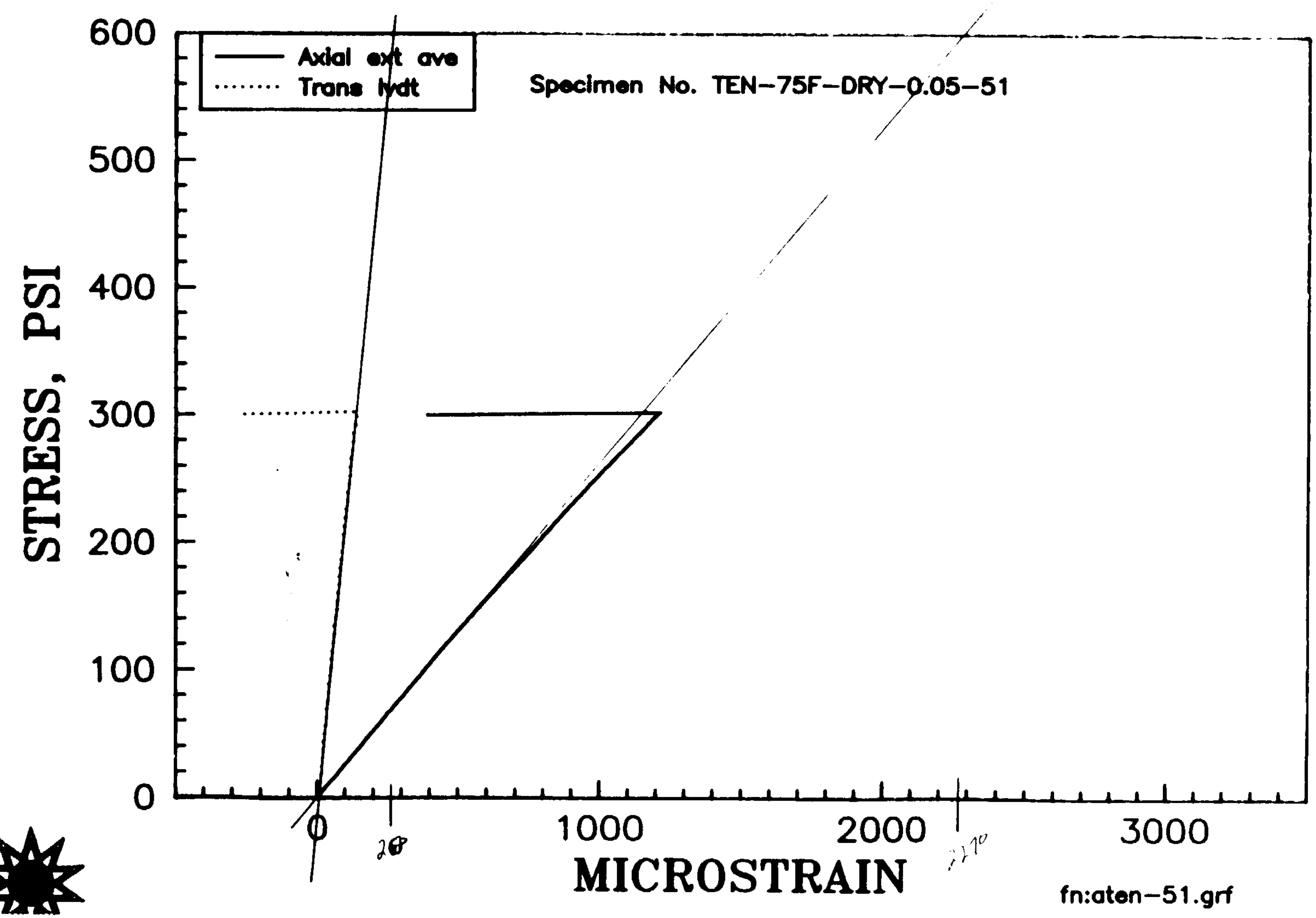
Testing Laboratory

PVA/MB SOLUBLE CORE TENSION TEST
BASELINE SAMPLES; NO HIGH HUMIDITY AGING



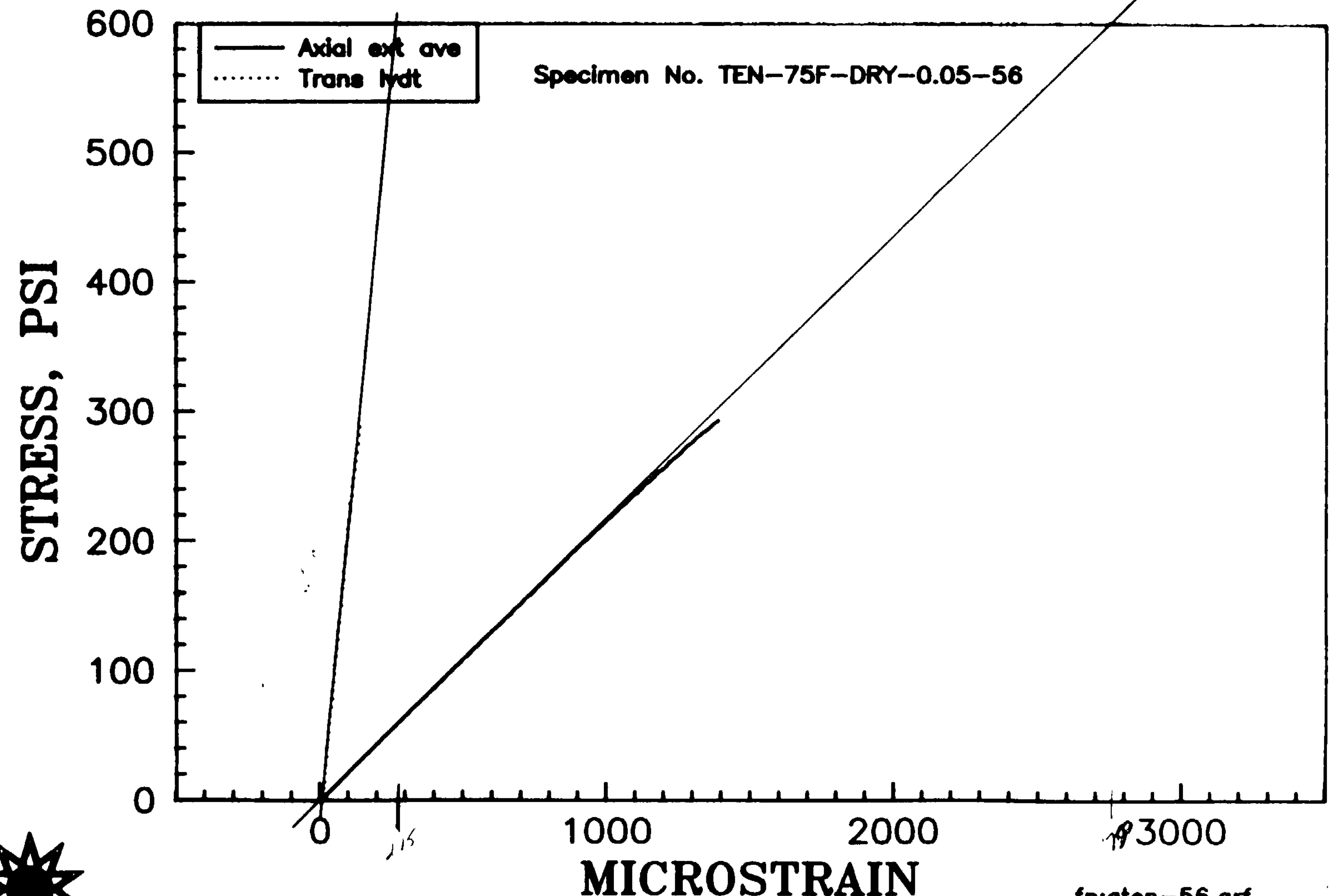
Energy Materials
Testing Laboratory

PVA/MB SOLUBLE CORE TENSION TEST BASELINE SAMPLES; NO HIGH HUMIDITY AGING



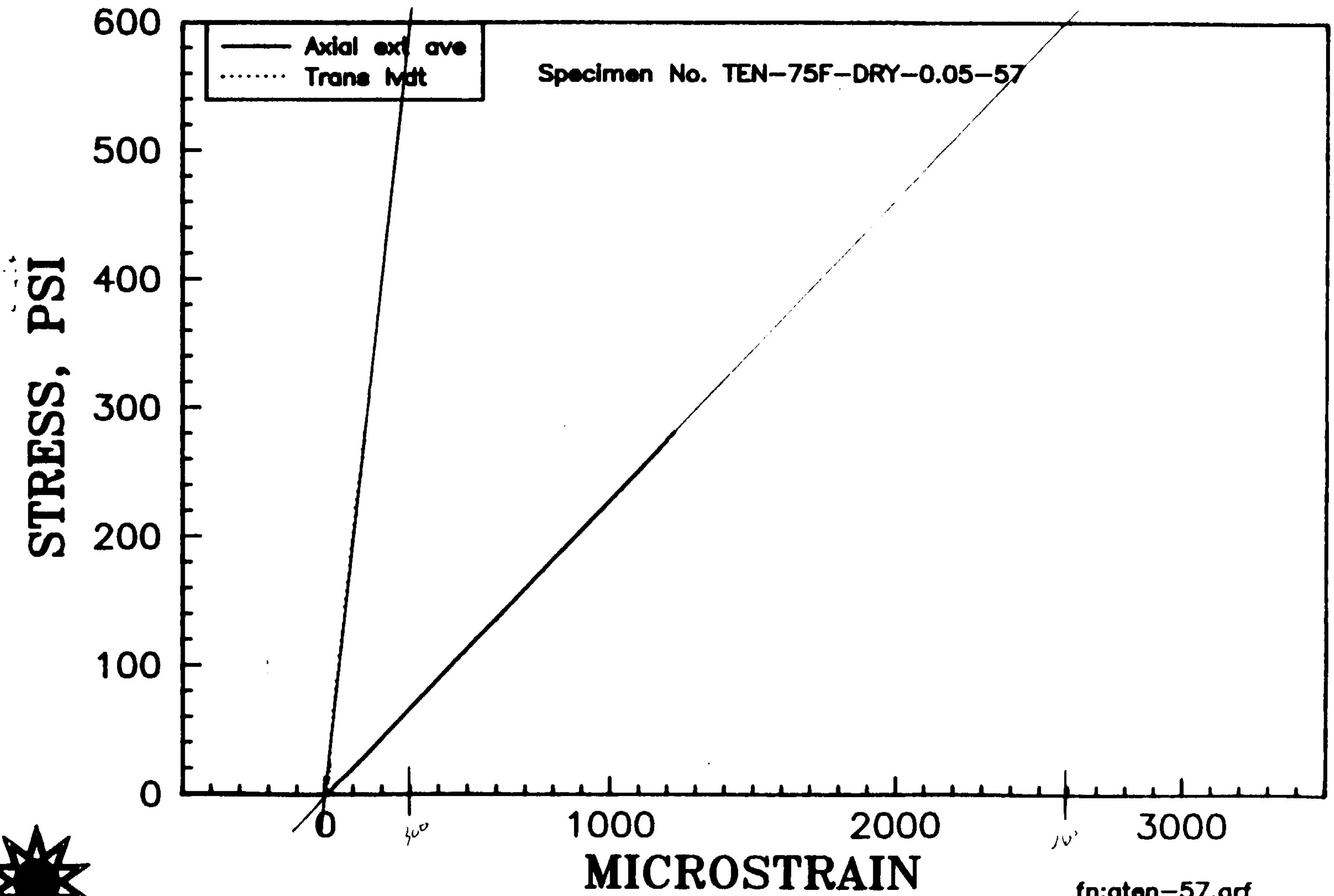
Energy Materials Testing Laboratory

PVA/MB SOLUBLE CORE TENSION TEST
BASELINE SAMPLES; NO HIGH HUMIDITY AGING



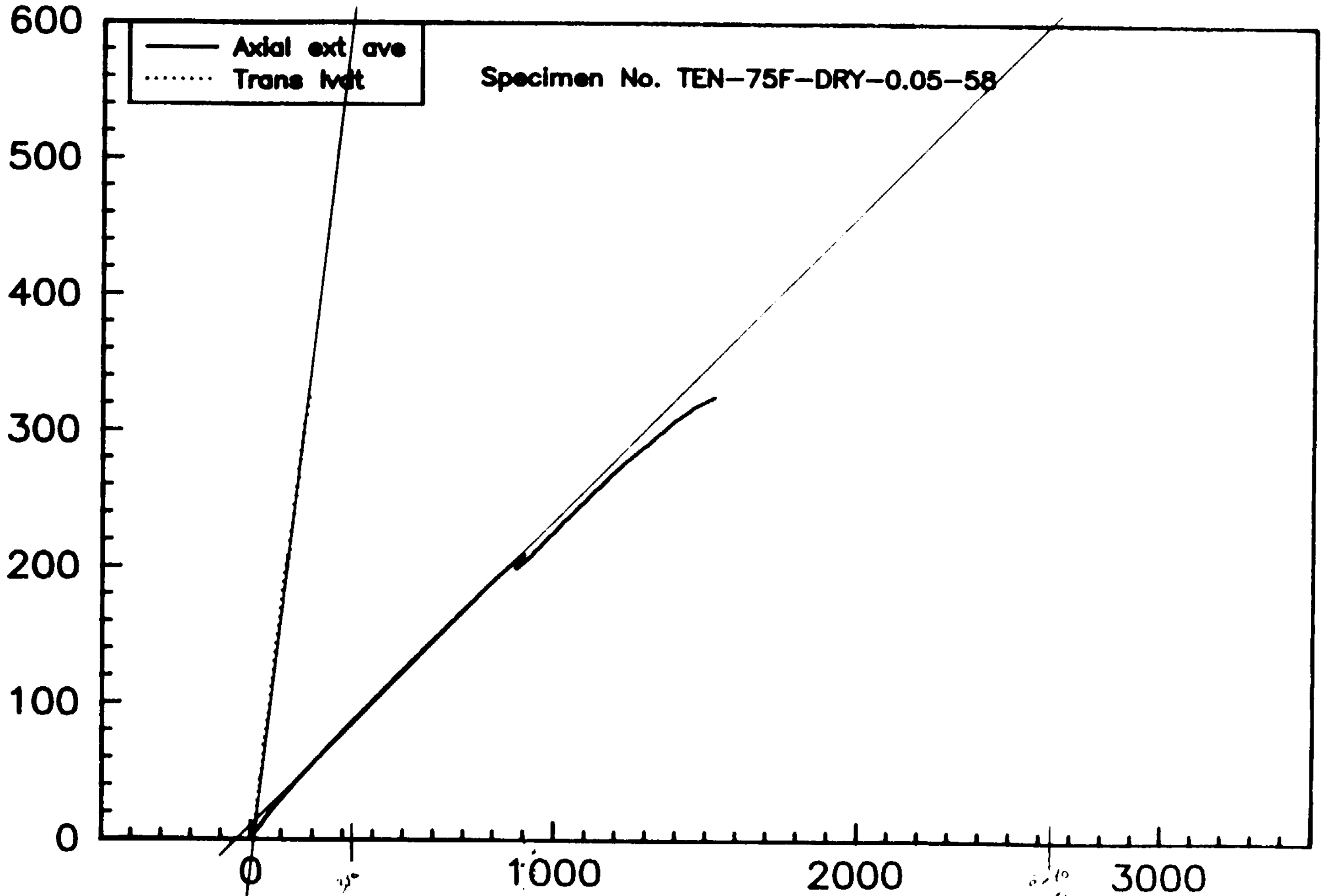
Energy Materials Testing Laboratory

PVA/MB SOLUBLE CORE TENSION TEST
BASELINE SAMPLES; NO HIGH HUMIDITY AGING



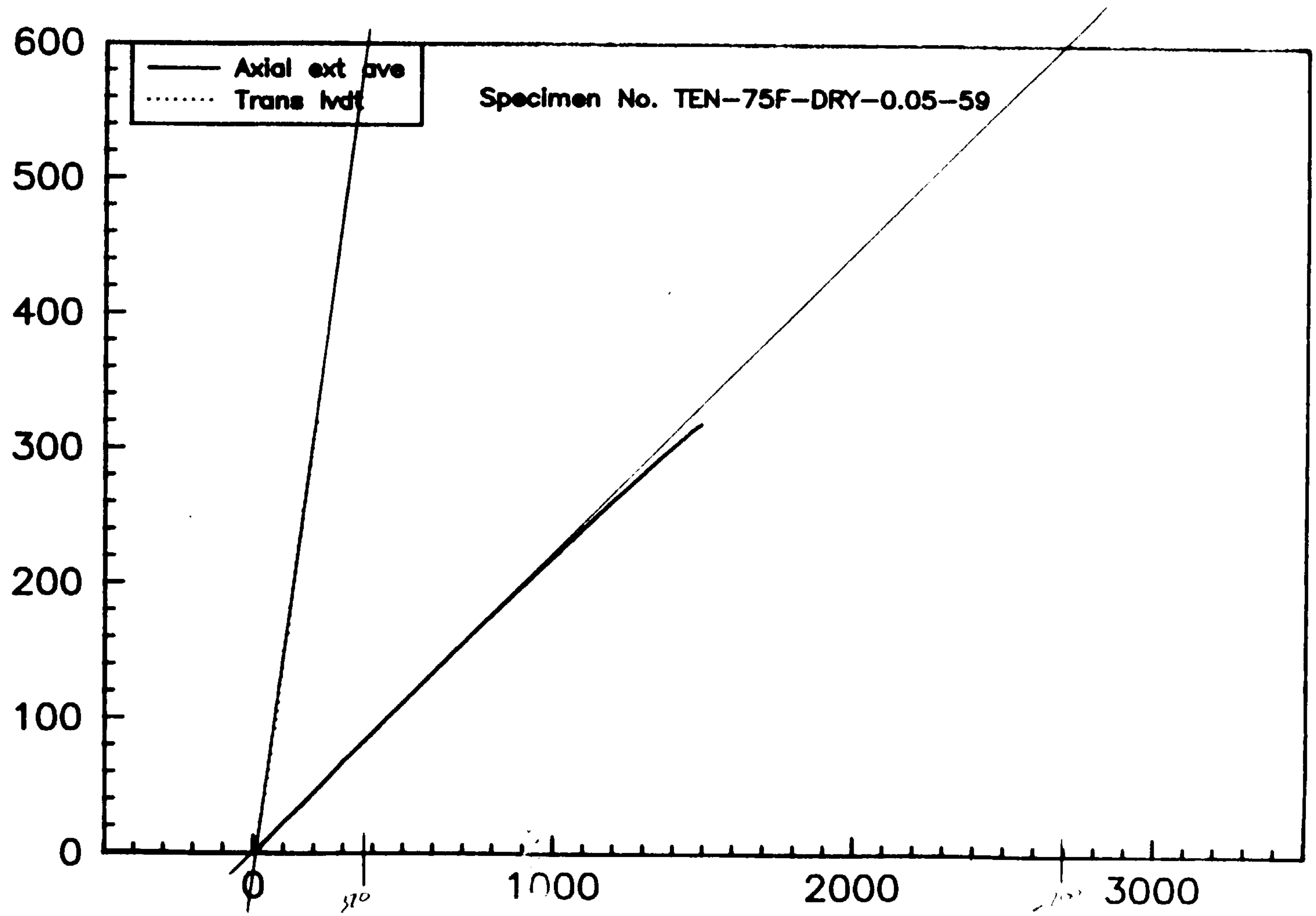
Energy Materials Testing Laboratory

PVA/MB SOLUBLE CORE TENSION TEST BASELINE SAMPLES; NO HIGH HUMIDITY AGING



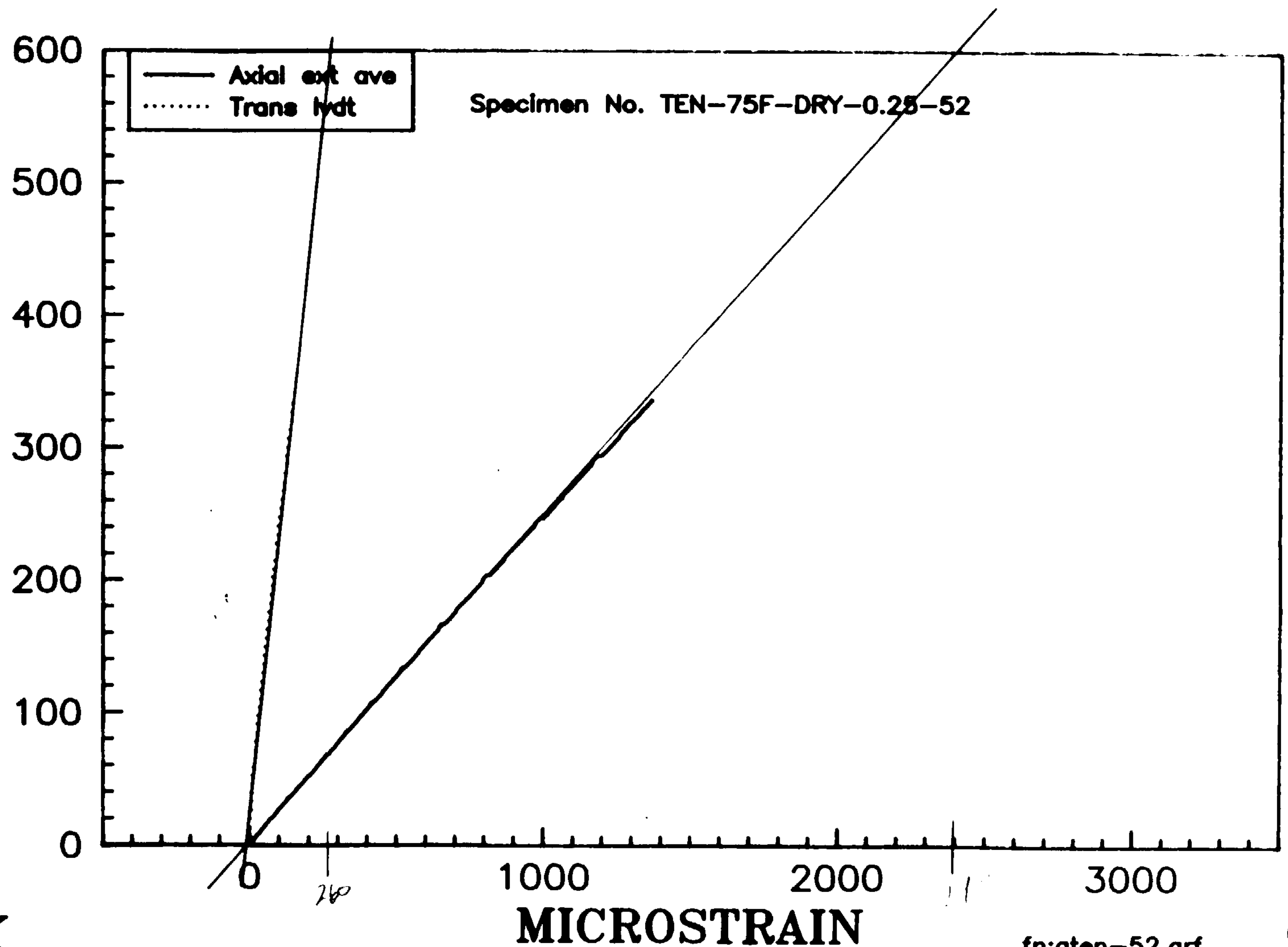
Energy Materials Testing Laboratory

PVA/MB SOLUBLE CORE TENSION TEST
BASELINE SAMPLES; NO HIGH HUMIDITY AGING



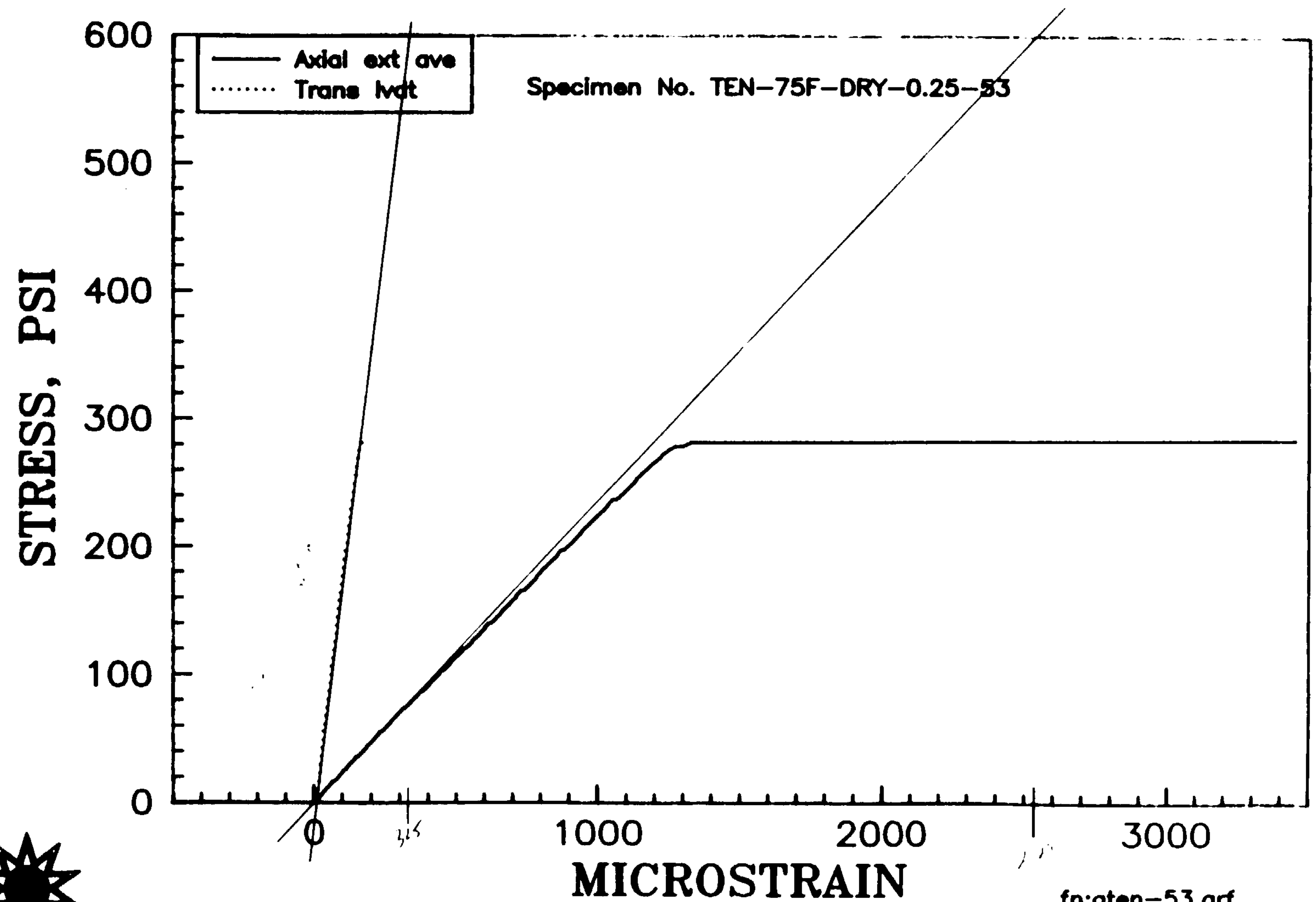
Energy Materials
Testing Laboratory

PVA/MB SOLUBLE CORE TENSION TEST
BASELINE SAMPLES; NO HIGH HUMIDITY AGING



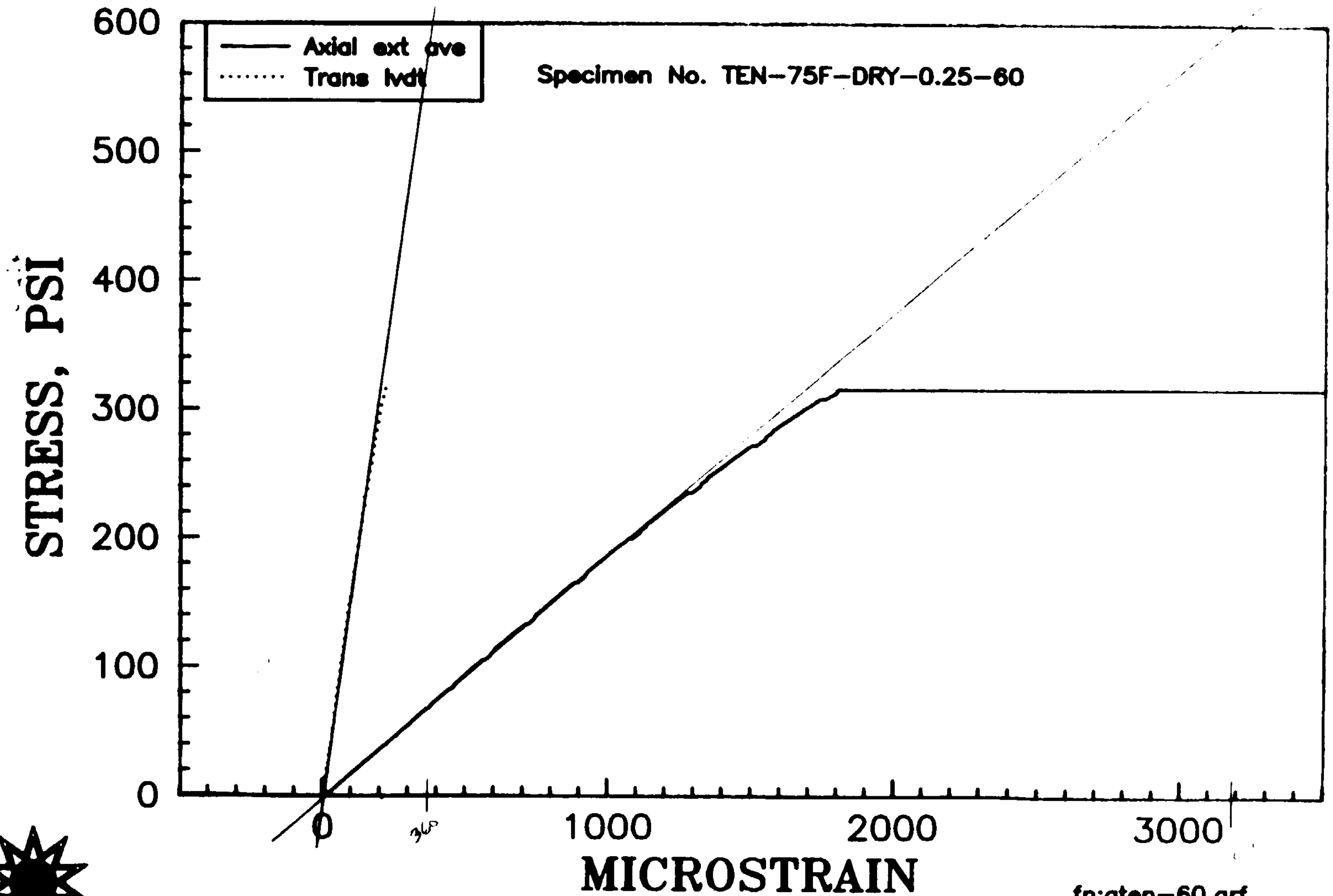
Energy Materials
Testing Laboratory

PVA/MB SOLUBLE CORE TENSION TEST
BASELINE SAMPLES; NO HIGH HUMIDITY AGING



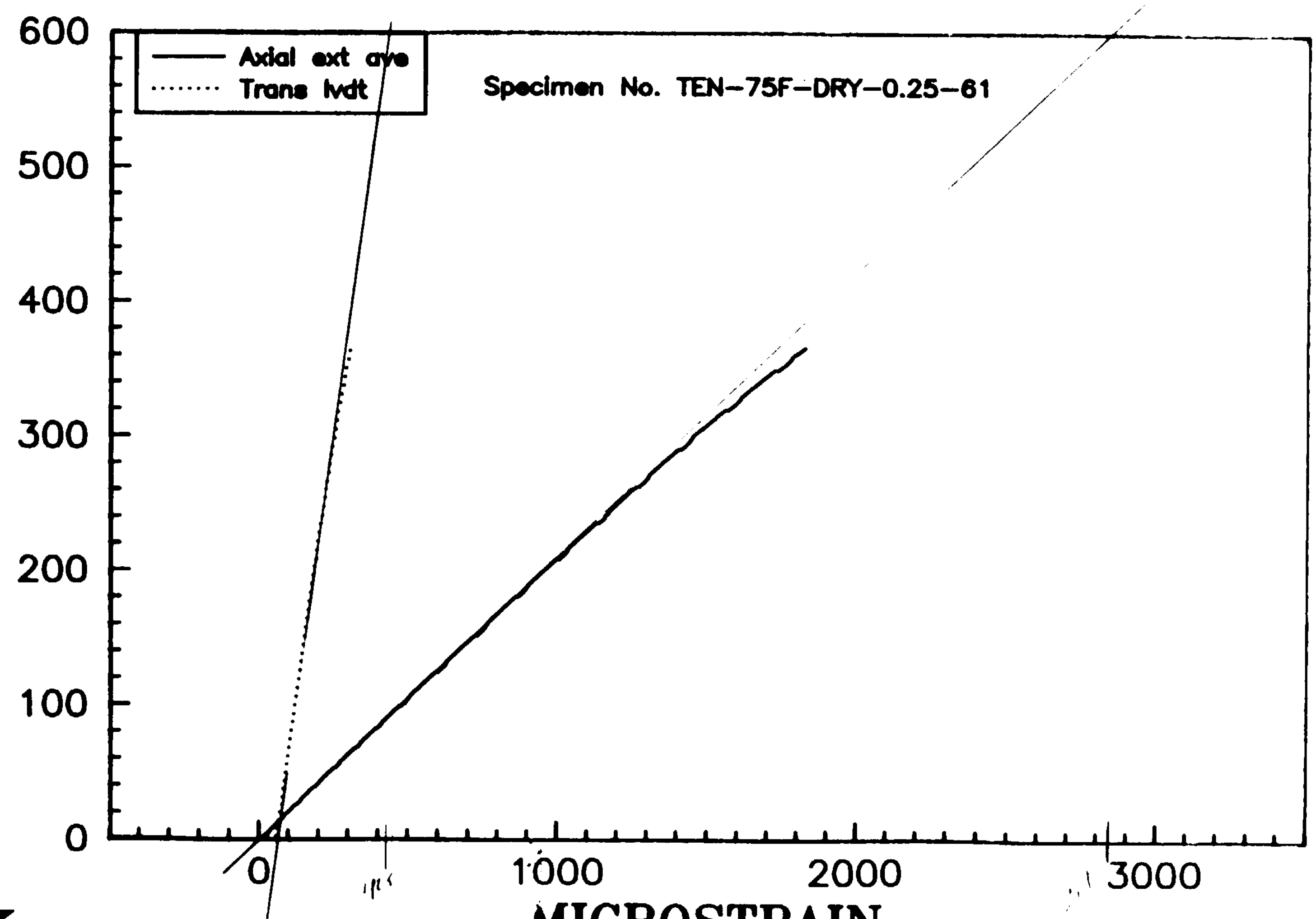
Energy Materials
Testing Laboratory

PVA/MB SOLUBLE CORE TENSION TEST
BASELINE SAMPLES; NO HIGH HUMIDITY AGING



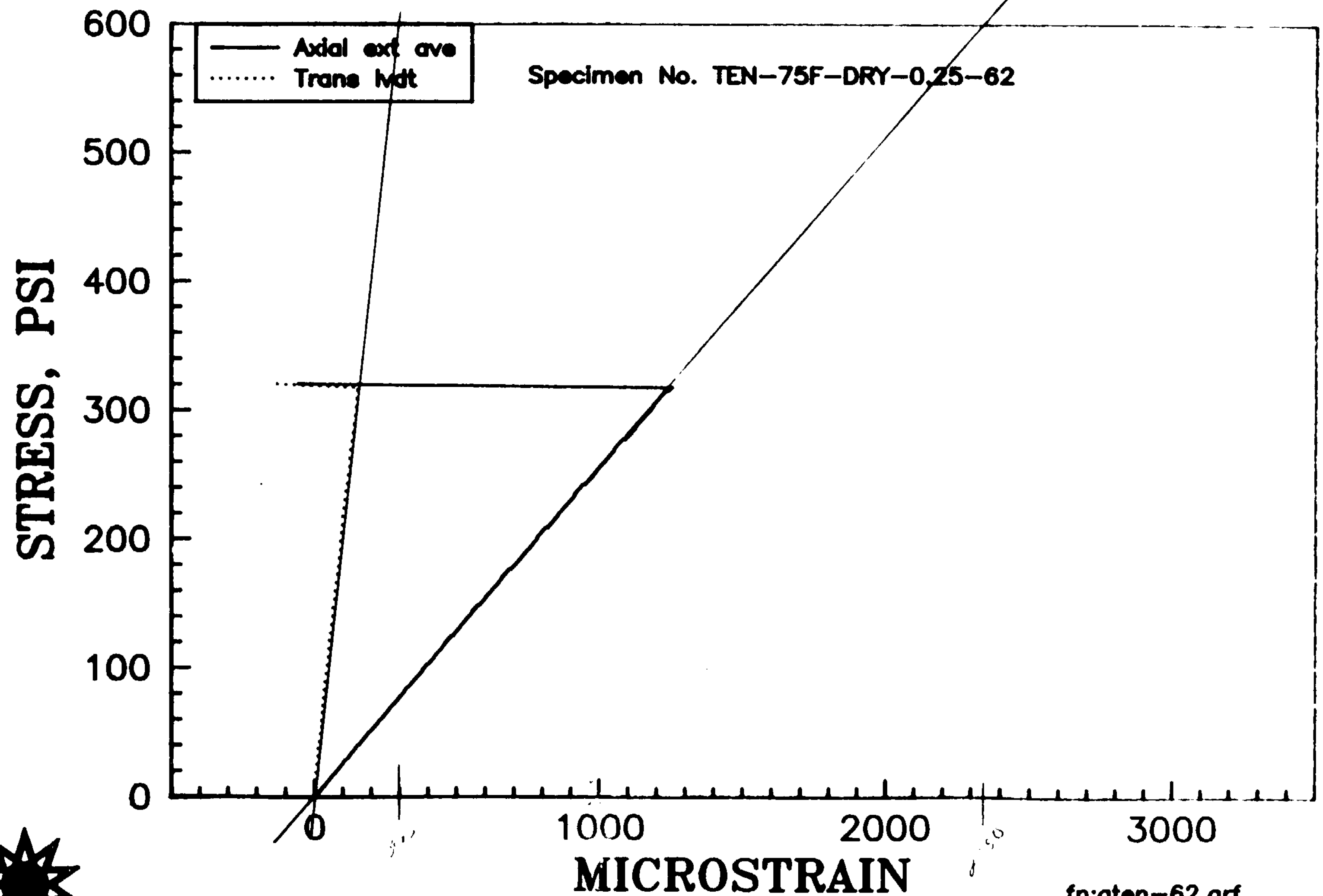
Energy Materials
Testing Laboratory

PVA/MB SOLUBLE CORE TENSION TEST BASELINE SAMPLES; NO HIGH HUMIDITY AGING



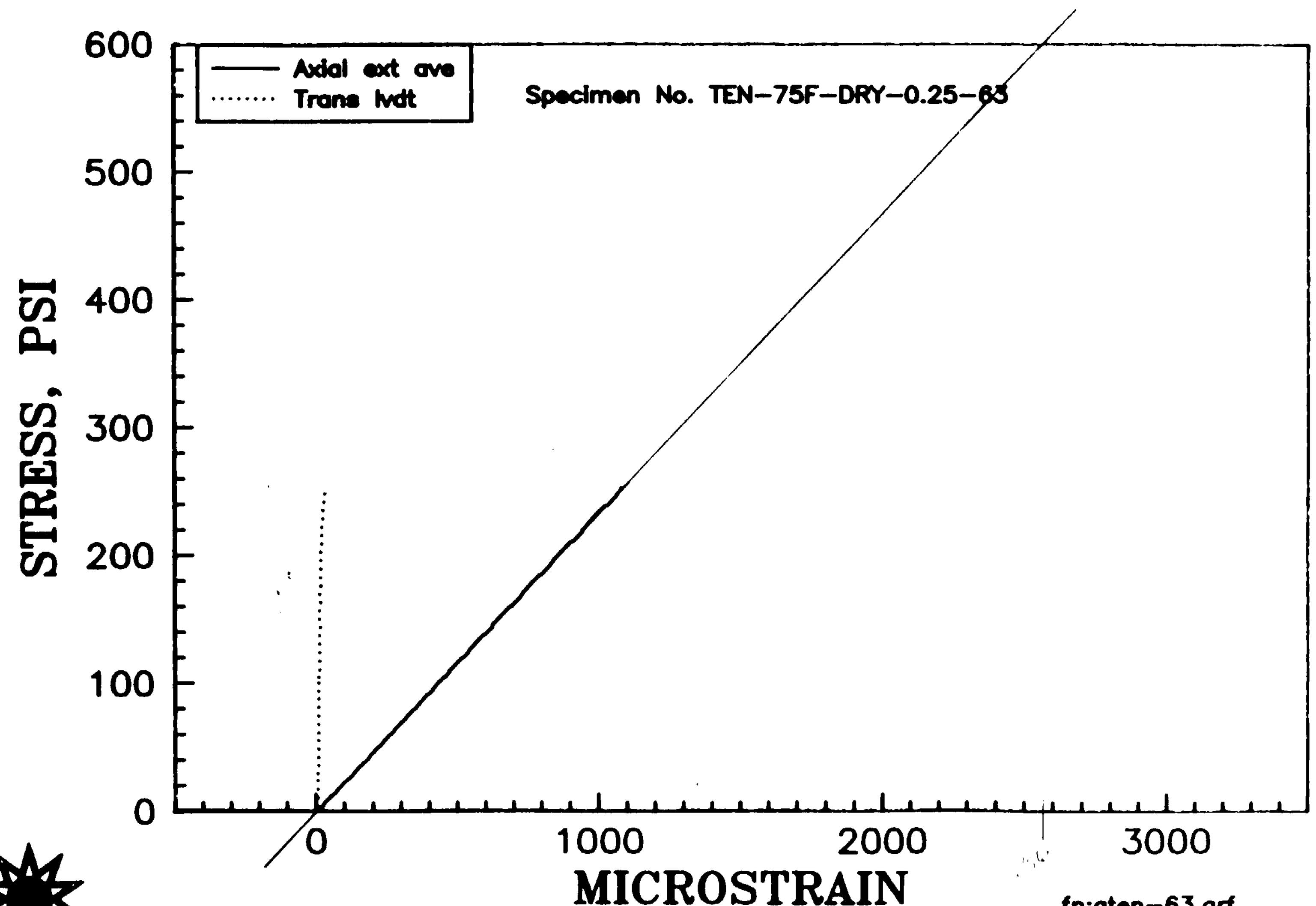
Energy Materials Testing Laboratory

PVA/MB SOLUBLE CORE TENSION TEST BASELINE SAMPLES; NO HIGH HUMIDITY AGING



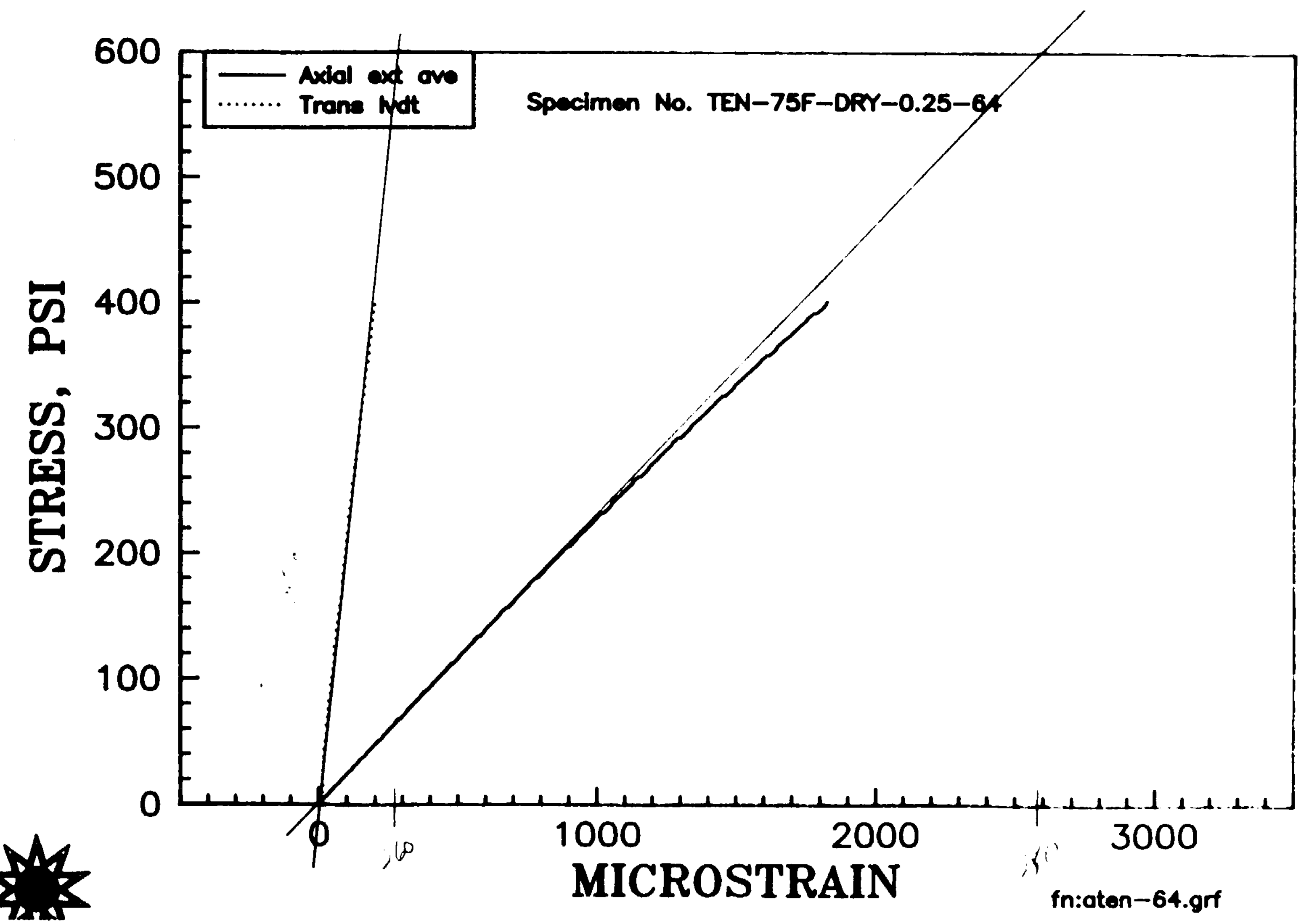
Energy Materials Testing Laboratory

PVA/MB SOLUBLE CORE TENSION TEST
BASELINE SAMPLES; NO HIGH HUMIDITY AGING



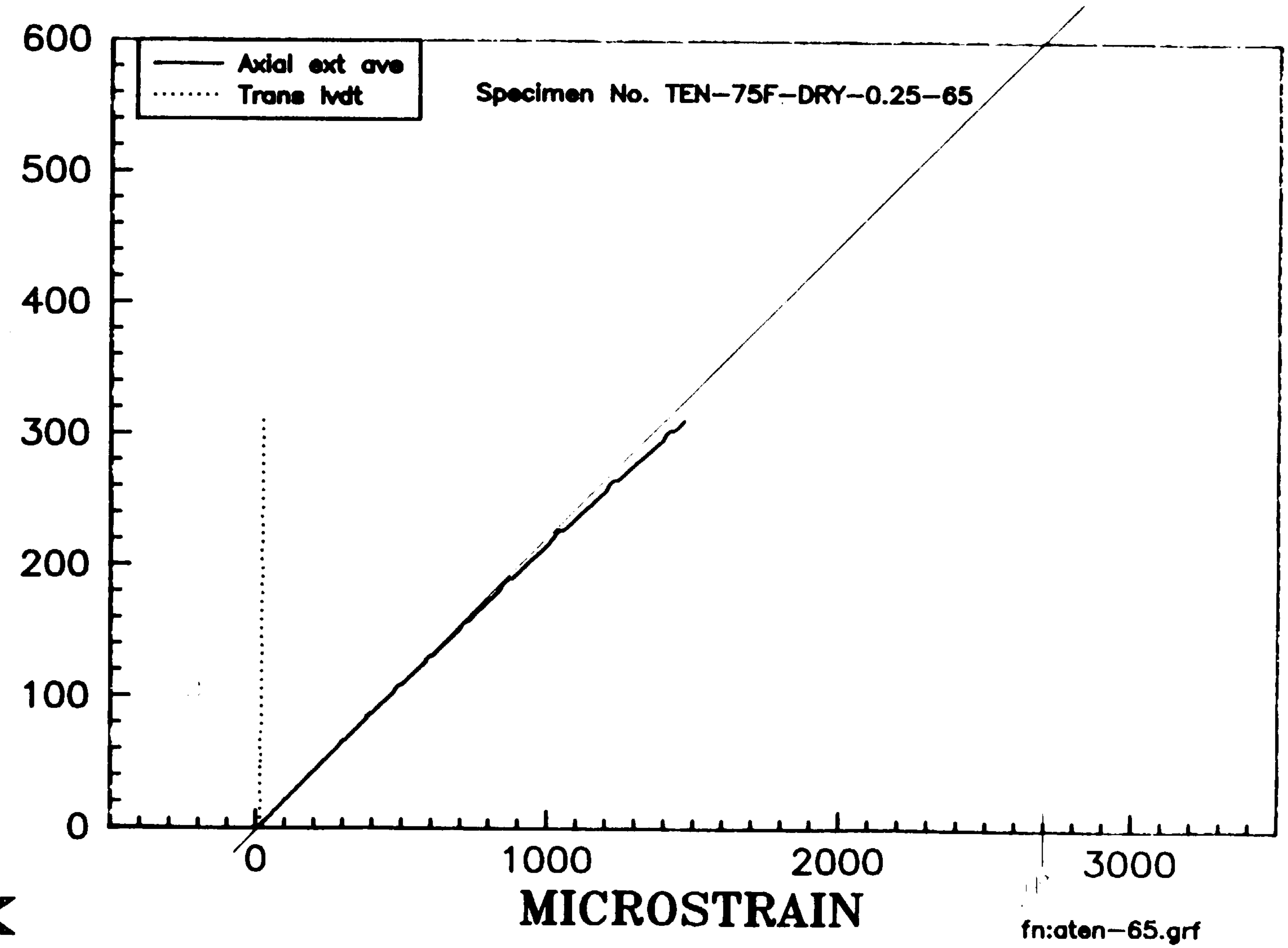
Energy Materials
Testing Laboratory

PVA/MB SOLUBLE CORE TENSION TEST
BASELINE SAMPLES; NO HIGH HUMIDITY AGING



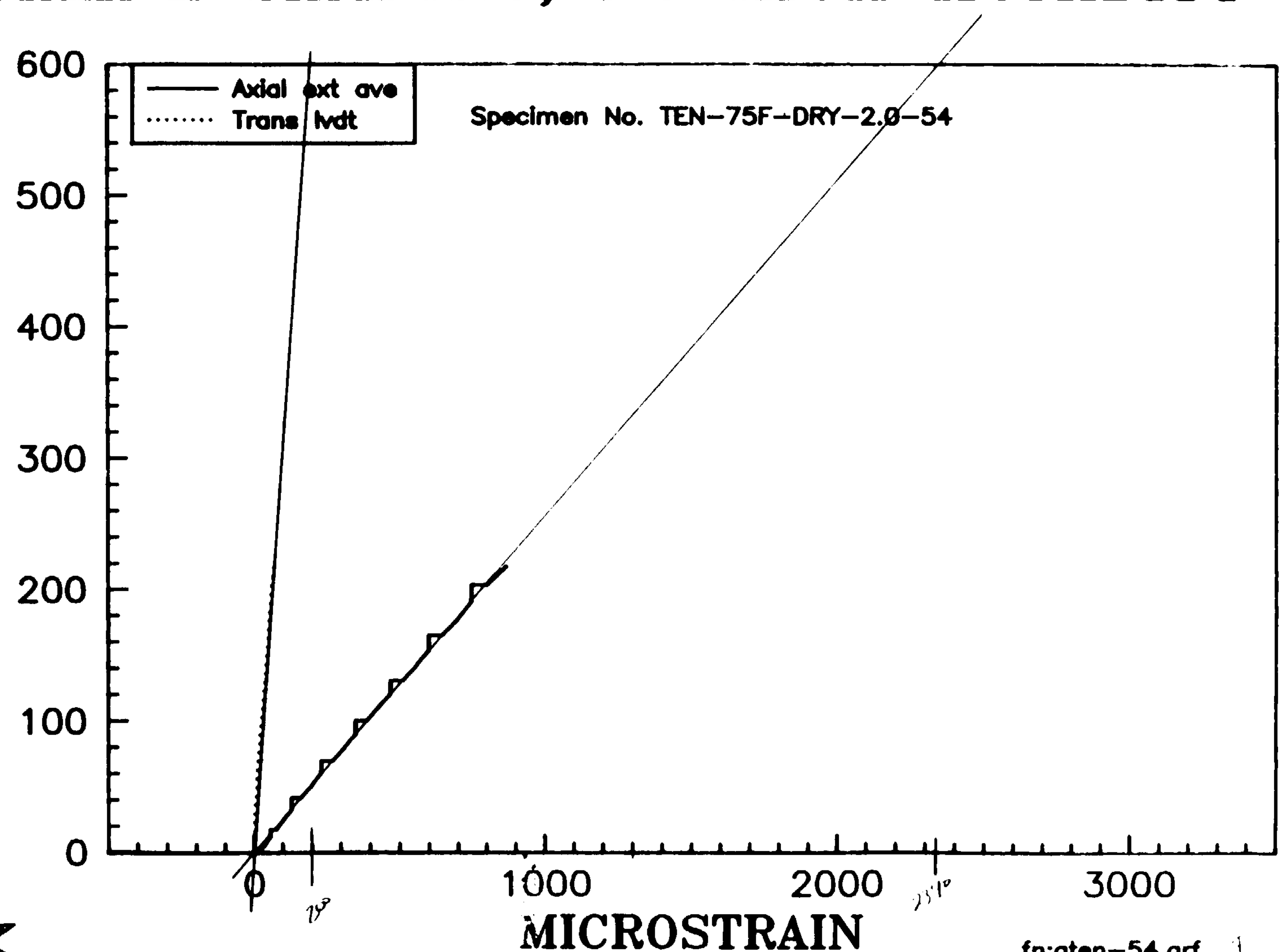
Energy Materials
Testing Laboratory

PVA/MB SOLUBLE CORE TENSION TEST
BASELINE SAMPLES; NO HIGH HUMIDITY AGING



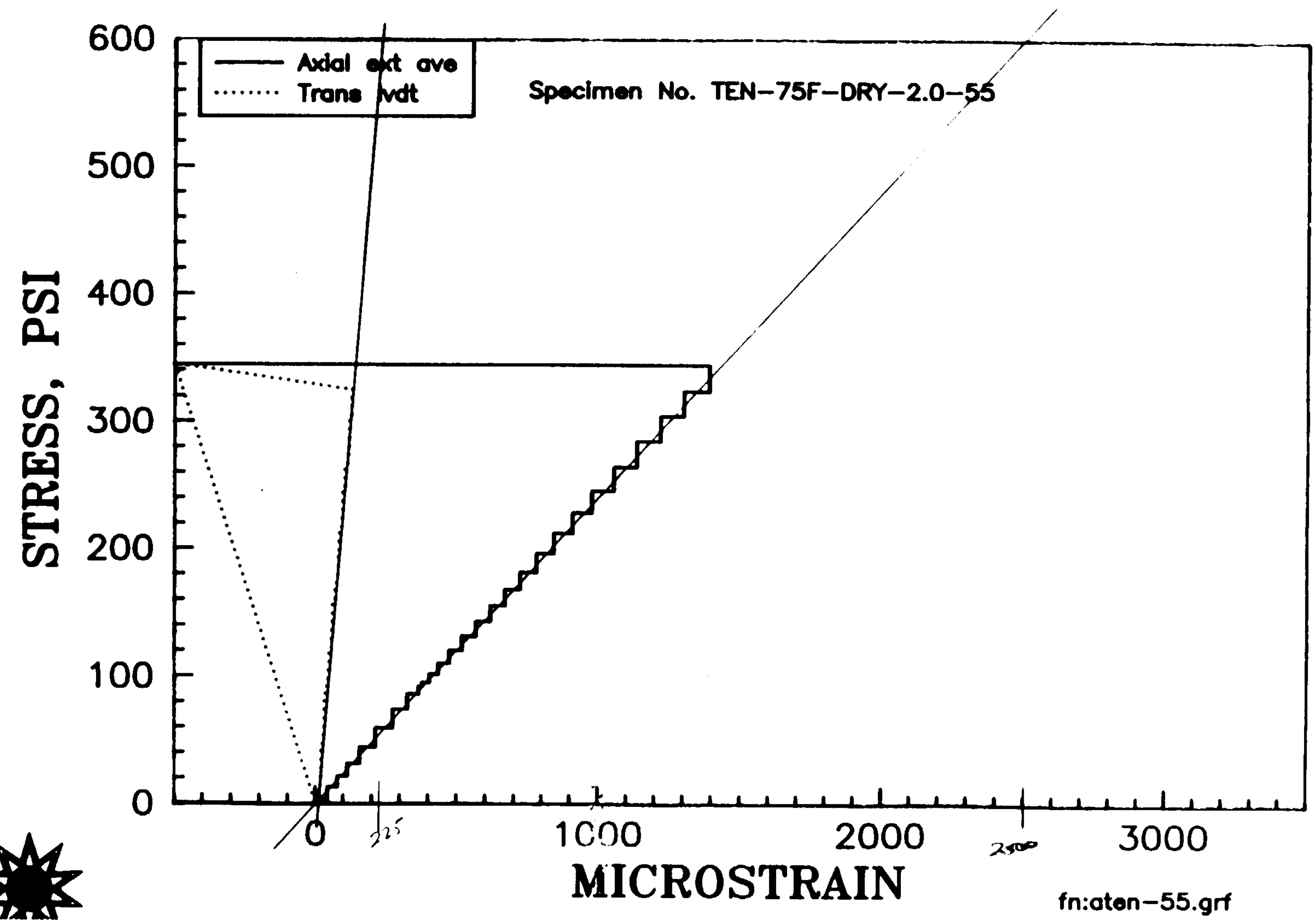
Energy Materials
Testing Laboratory

PVA/MB SOLUBLE CORE TENSION TEST
BASELINE SAMPLES; NO HIGH HUMIDITY AGING



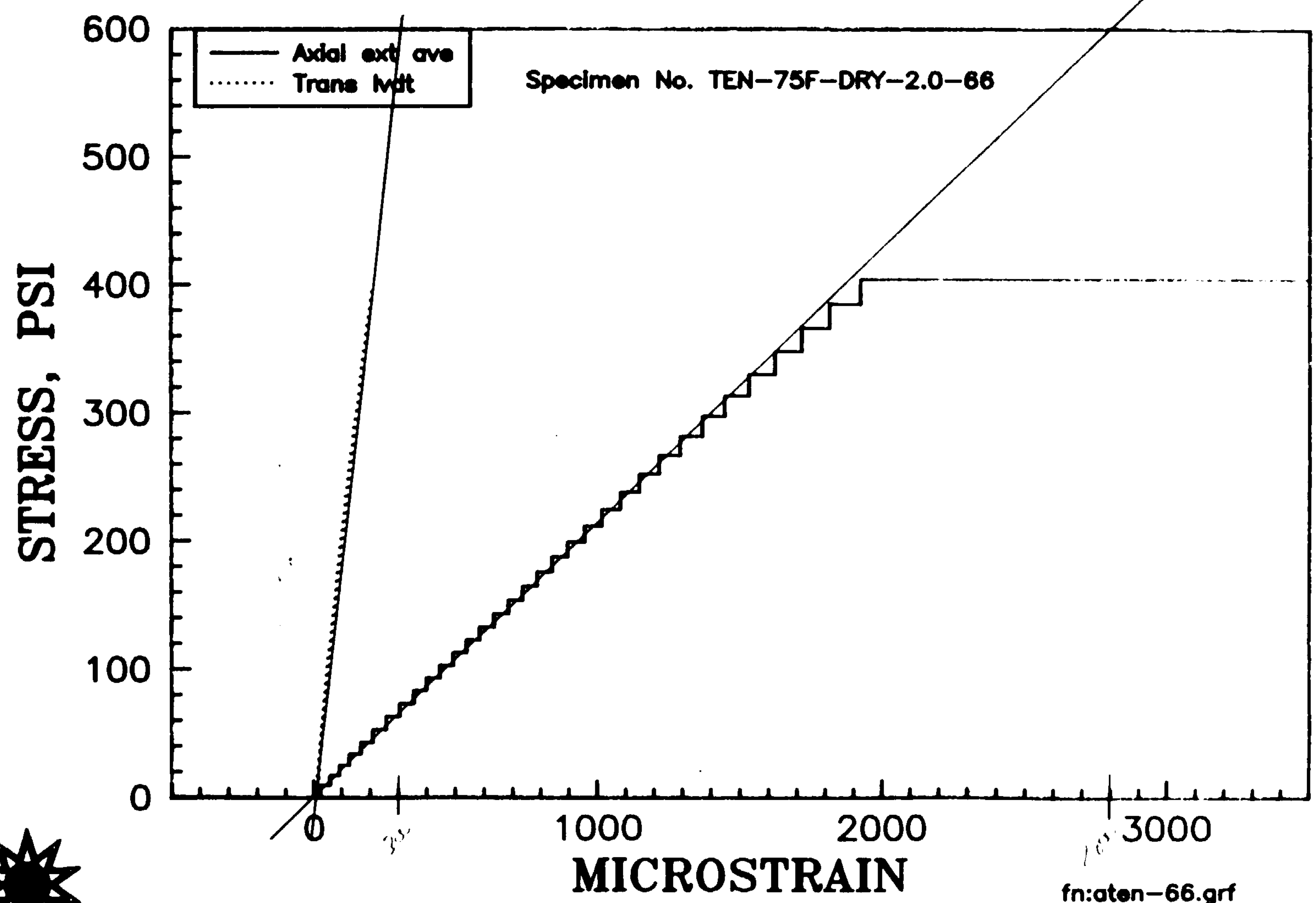
Energy Materials
Testing Laboratory

PVA/MB SOLUBLE CORE TENSION TEST
BASELINE SAMPLES; NO HIGH HUMIDITY AGING



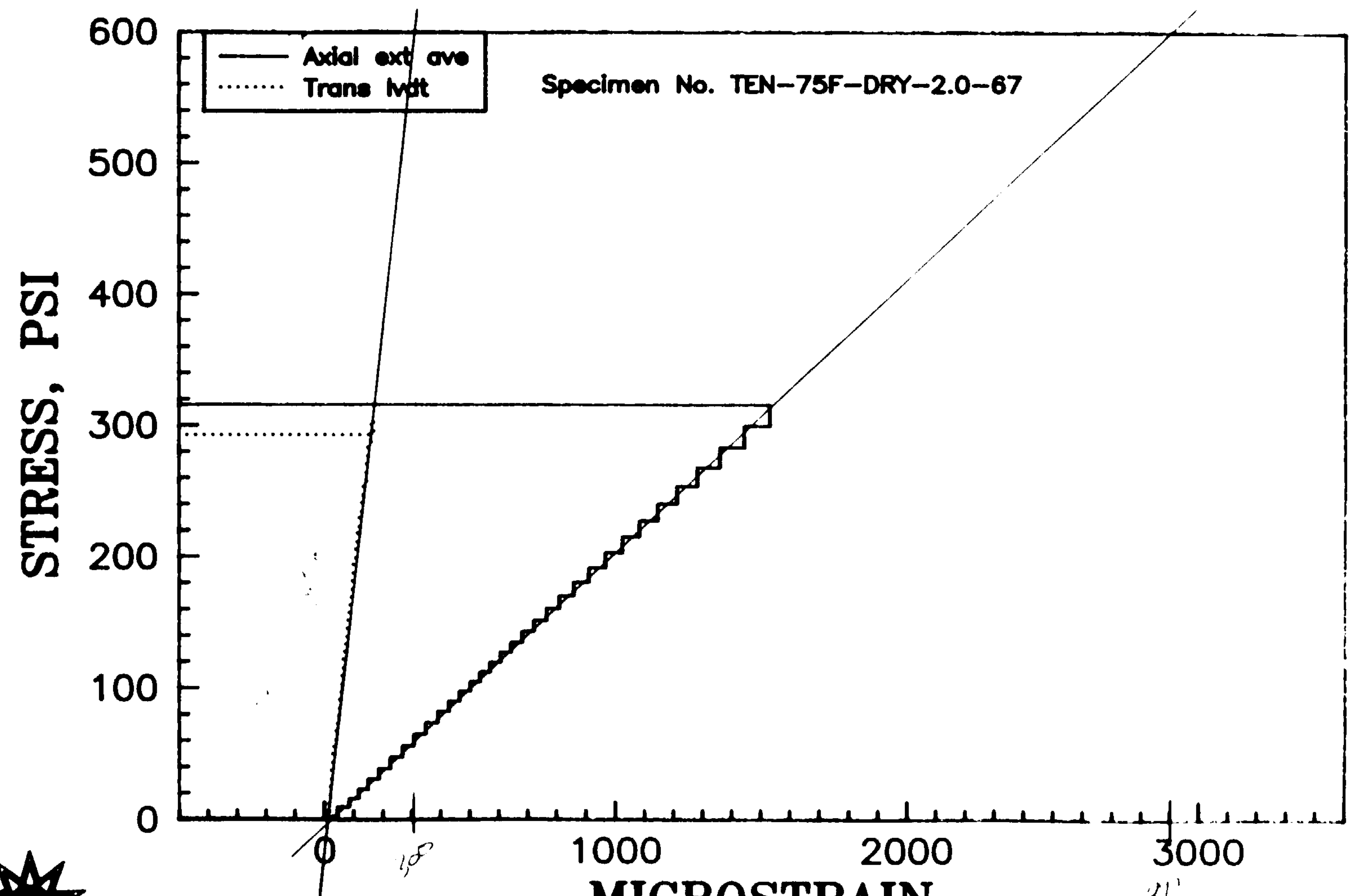
Energy Materials
Testing Laboratory

PVA/MB SOLUBLE CORE TENSION TEST
BASELINE SAMPLES; NO HIGH HUMIDITY AGING

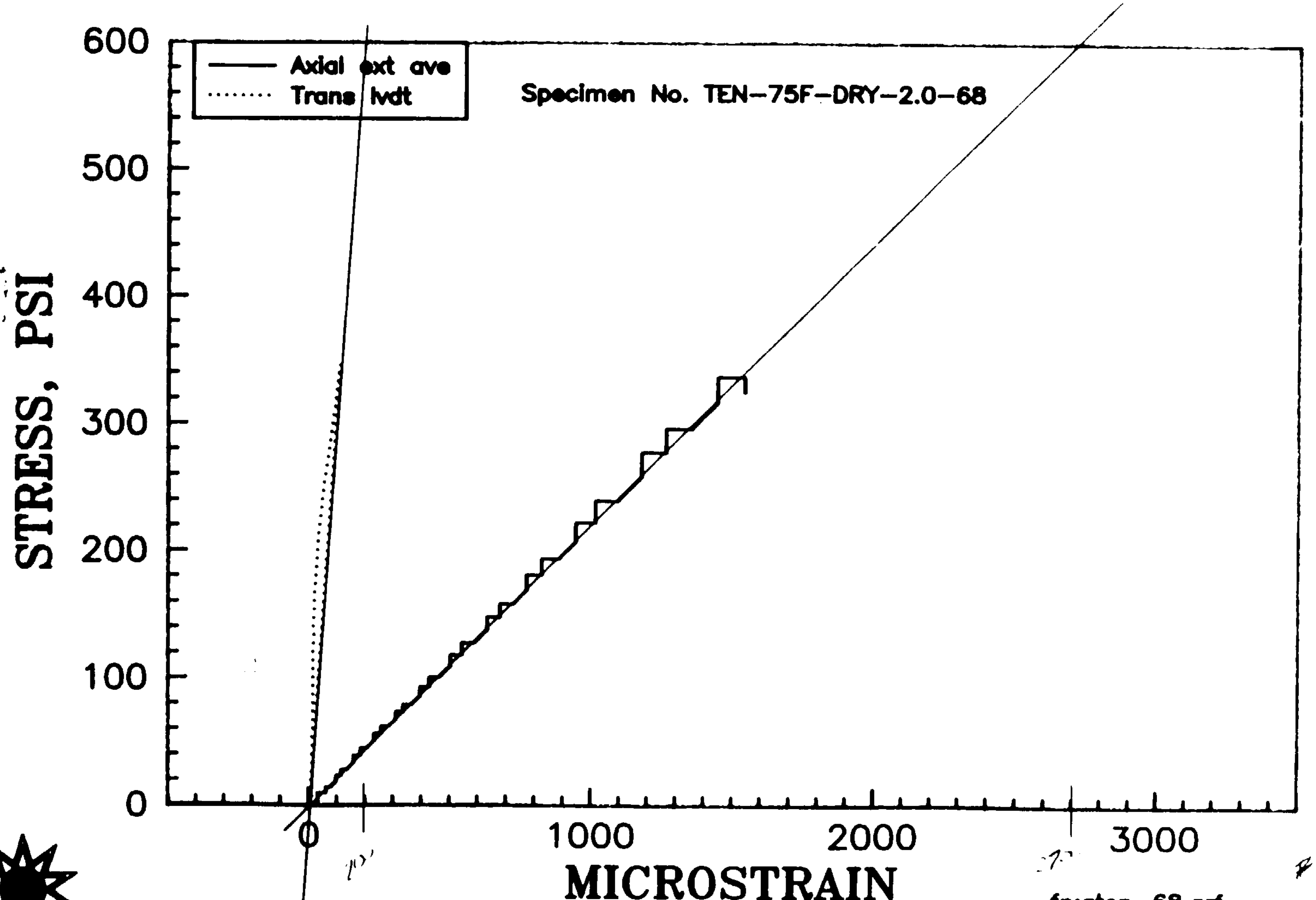


Energy Materials Testing Laboratory

PVA/MB SOLUBLE CORE TENSION TEST
BASELINE SAMPLES; NO HIGH HUMIDITY AGING

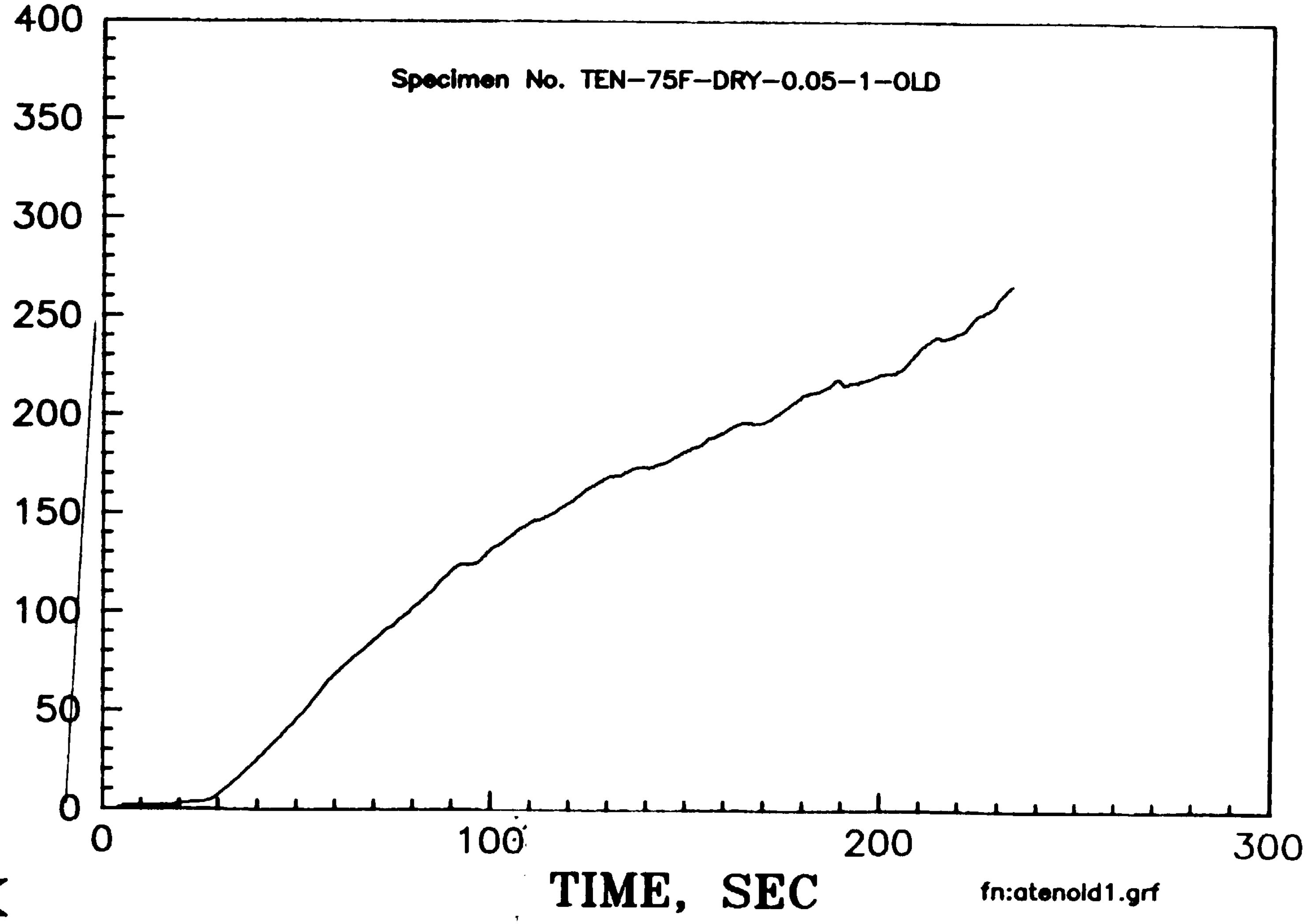


PVA/MB SOLUBLE CORE TENSION TEST
BASELINE SAMPLES; NO HIGH HUMIDITY AGING



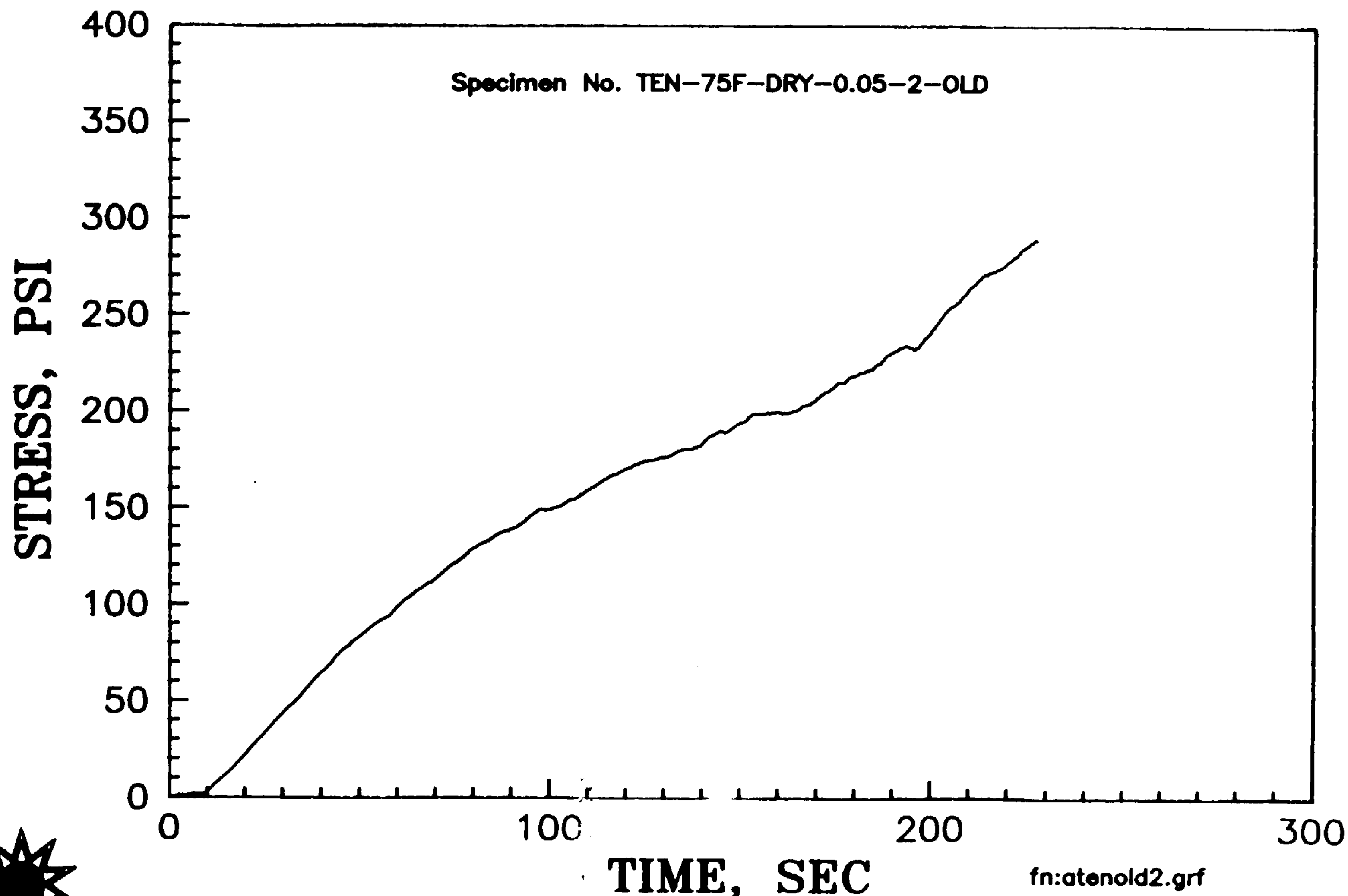
Energy Materials
Testing Laboratory

PVA/MB SOLUBLE CORE TENSION TEST BASELINE SAMPLES; NO HIGH HUMIDITY AGING OLD SPECIMEN GEOMETRY



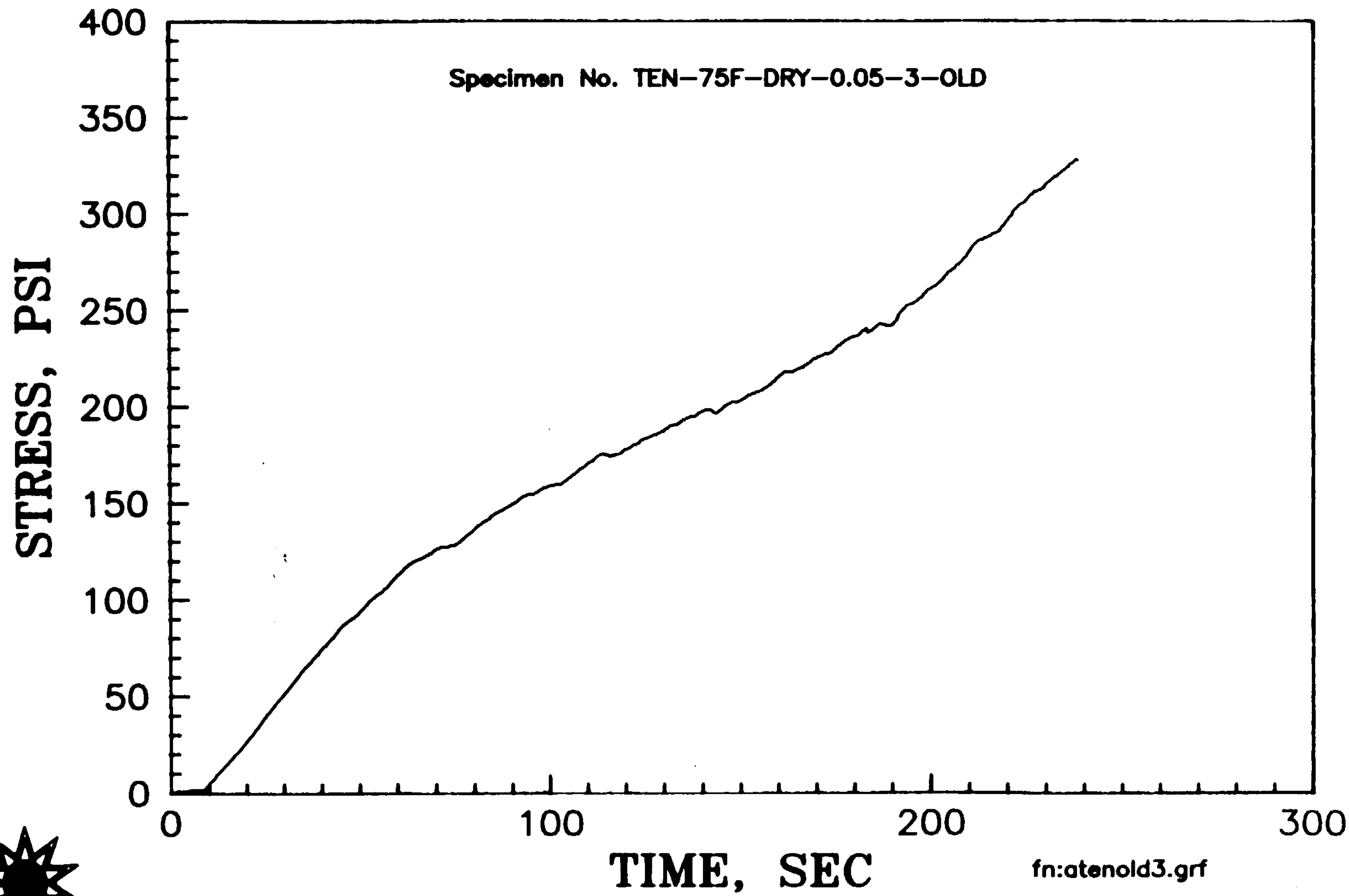
Energy Materials Testing Laboratory

PVA/MB SOLUBLE CORE TENSION TEST
BASELINE SAMPLES; NO HIGH HUMIDITY AGING
OLD SPECIMEN GEOMETRY



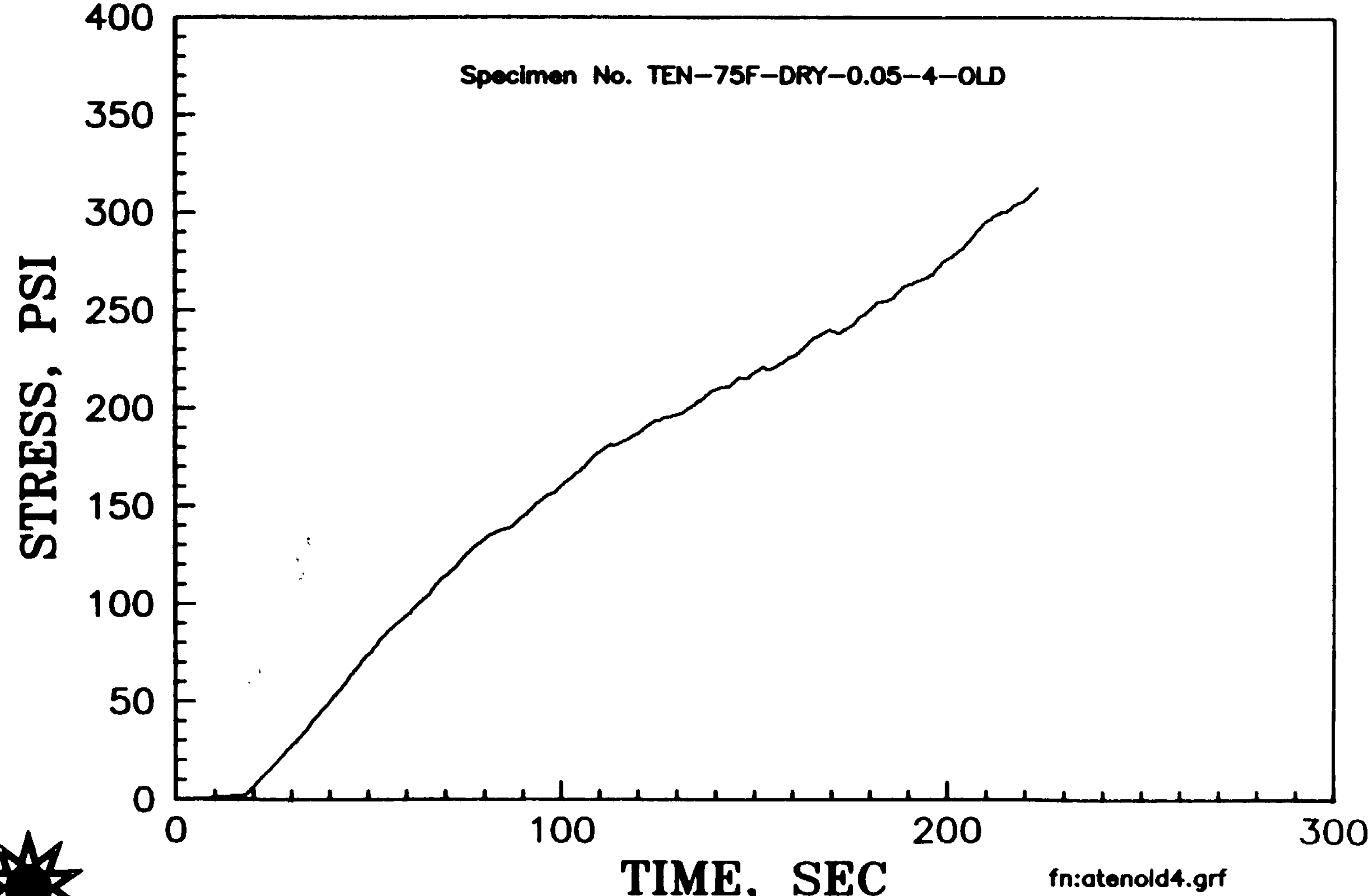
Energy Materials
Testing Laboratory

PVA/MB SOLUBLE CORE TENSION TEST
BASELINE SAMPLES; NO HIGH HUMIDITY AGING
OLD SPECIMEN GEOMETRY



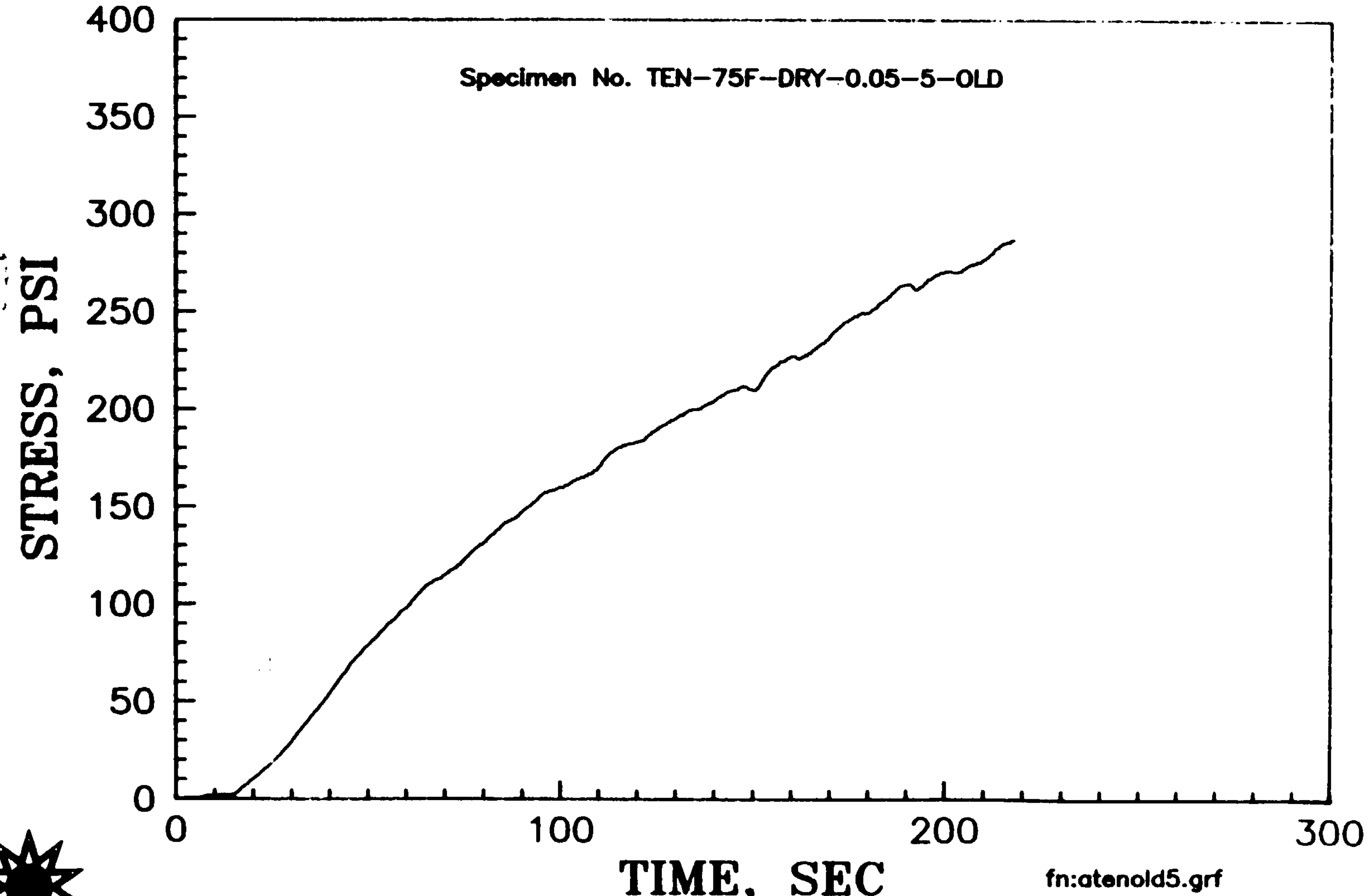
Energy Materials
Testing Laboratory

PVA/MB SOLUBLE CORE TENSION TEST
BASELINE SAMPLES; NO HIGH HUMIDITY AGING
OLD SPECIMEN GEOMETRY



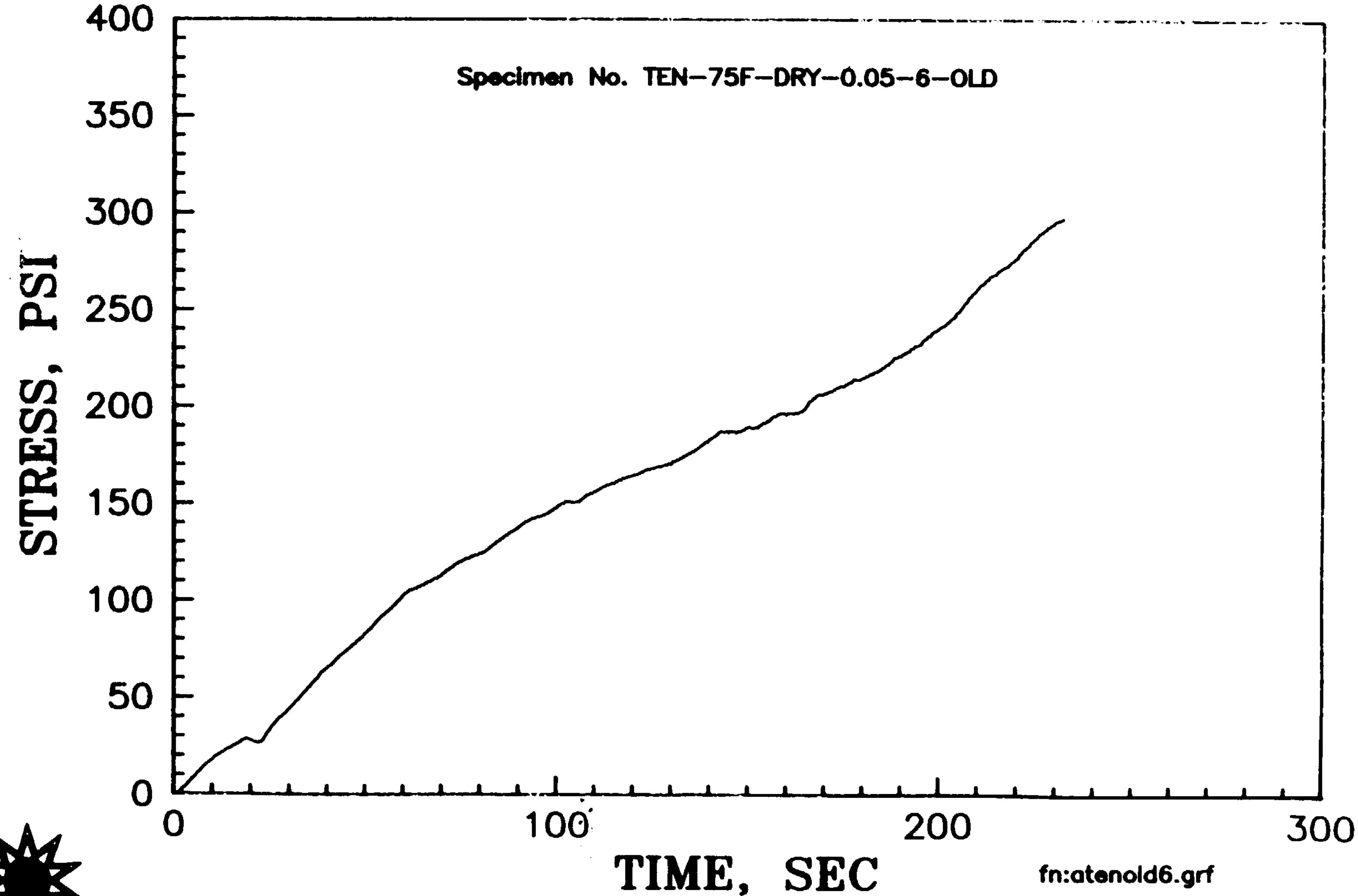
Energy Materials
Testing Laboratory

PVA/MB SOLUBLE CORE TENSION TEST
BASELINE SAMPLES; NO HIGH HUMIDITY AGING
OLD SPECIMEN GEOMETRY



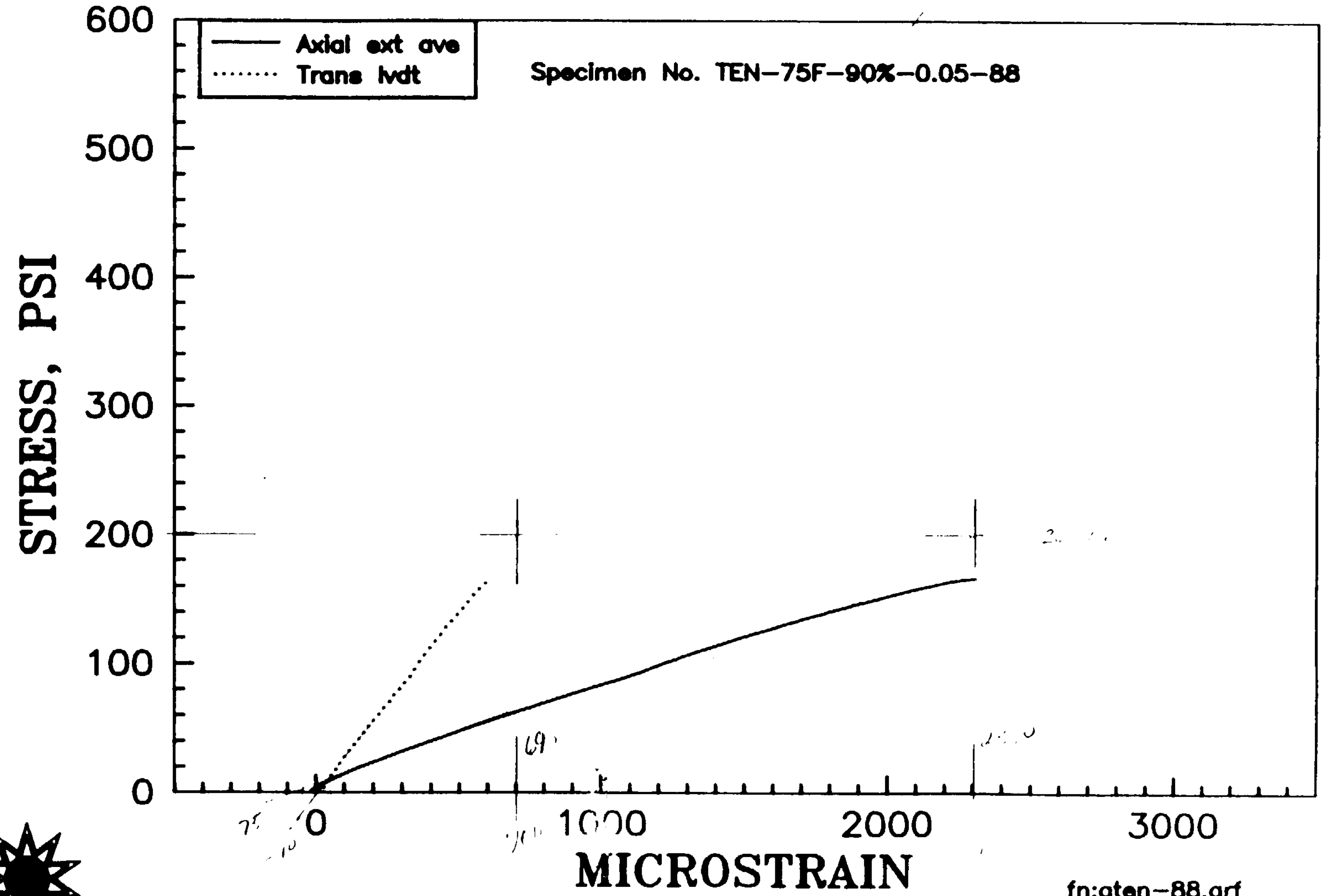
Energy Materials
Testing Laboratory

PVA/MB SOLUBLE CORE TENSION TEST
BASELINE SAMPLES; NO HIGH HUMIDITY AGING
OLD SPECIMEN GEOMETRY



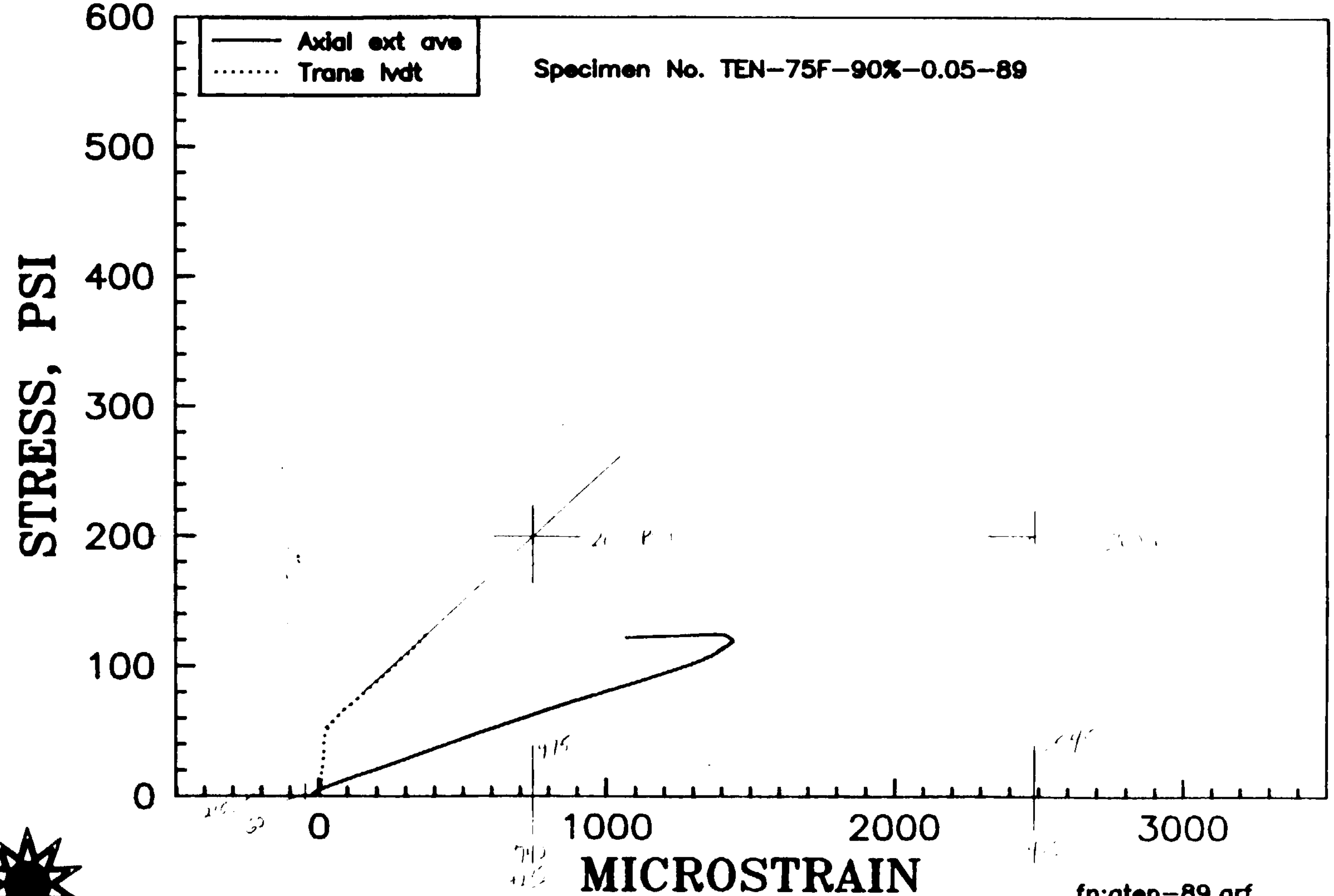
Energy Materials
Testing Laboratory

PVA/MB SOLUBLE CORE TENSION TEST
AGED AT 90°F, 90%RH



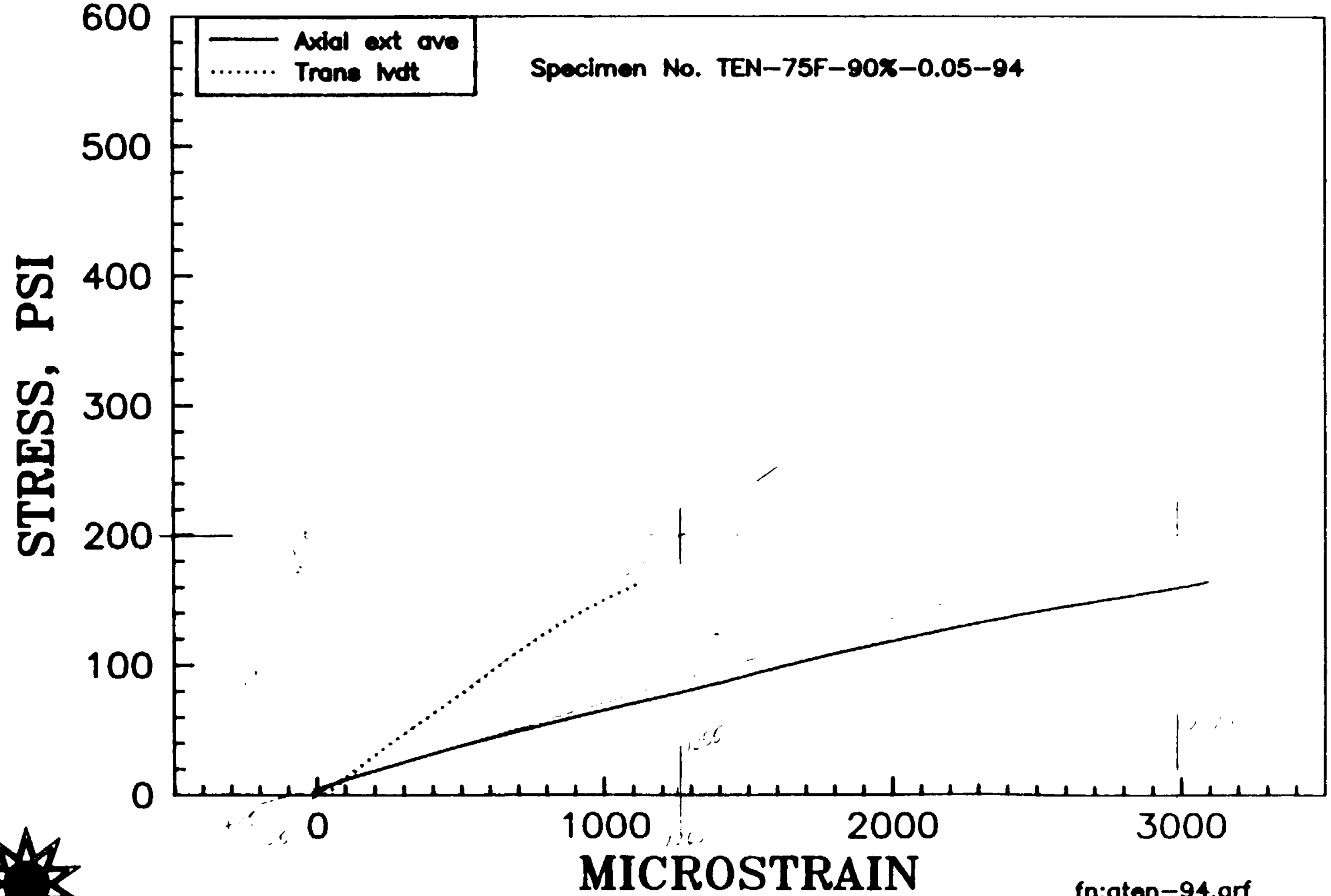
Energy Materials
Testing Laboratory

PVA/MB SOLUBLE CORE TENSION TEST
AGED AT 90°F, 90%RH



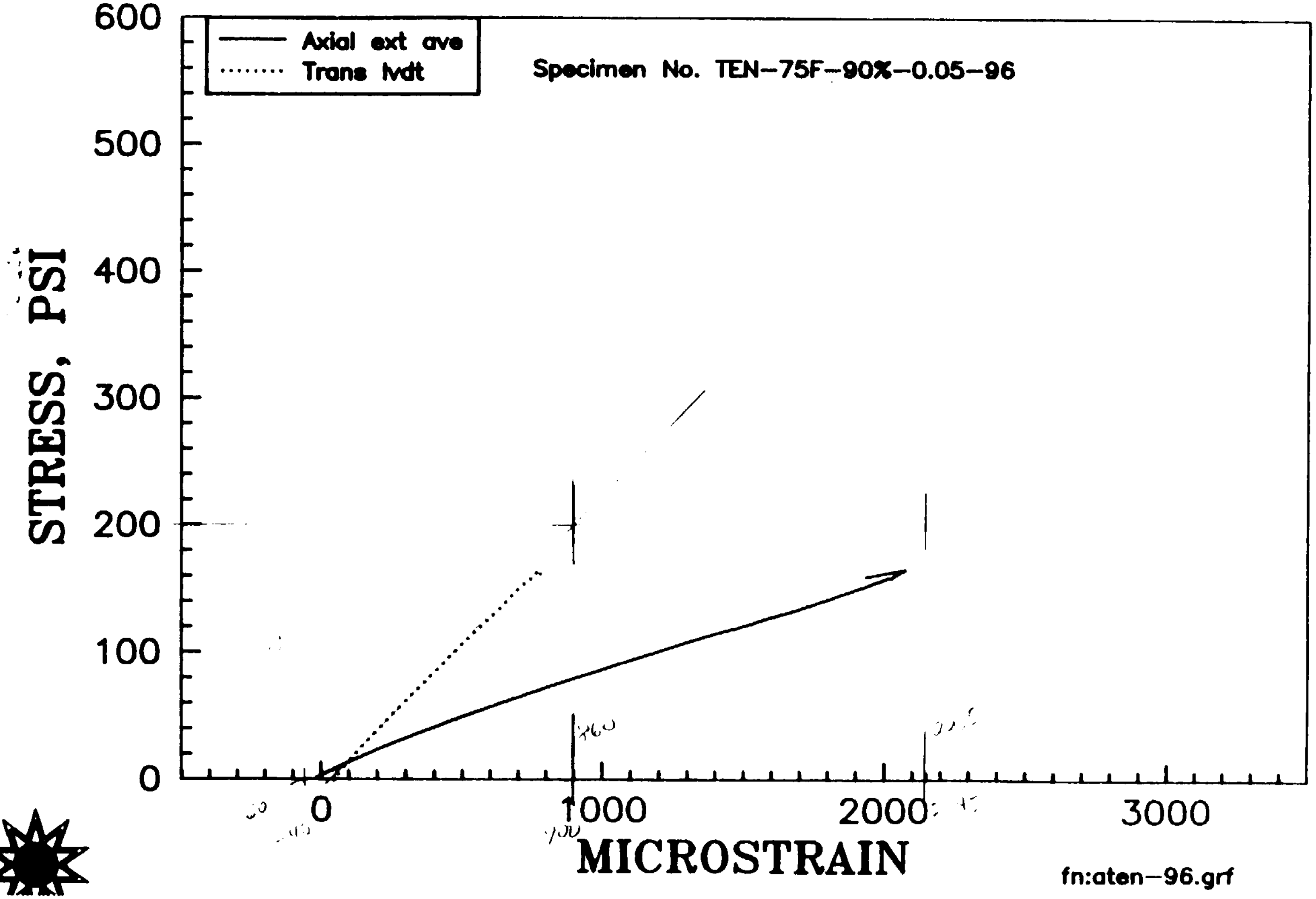
Energy Materials
Testing Laboratory

PVA/MB SOLUBLE CORE TENSION TEST
AGED AT 90°F, 90%RH



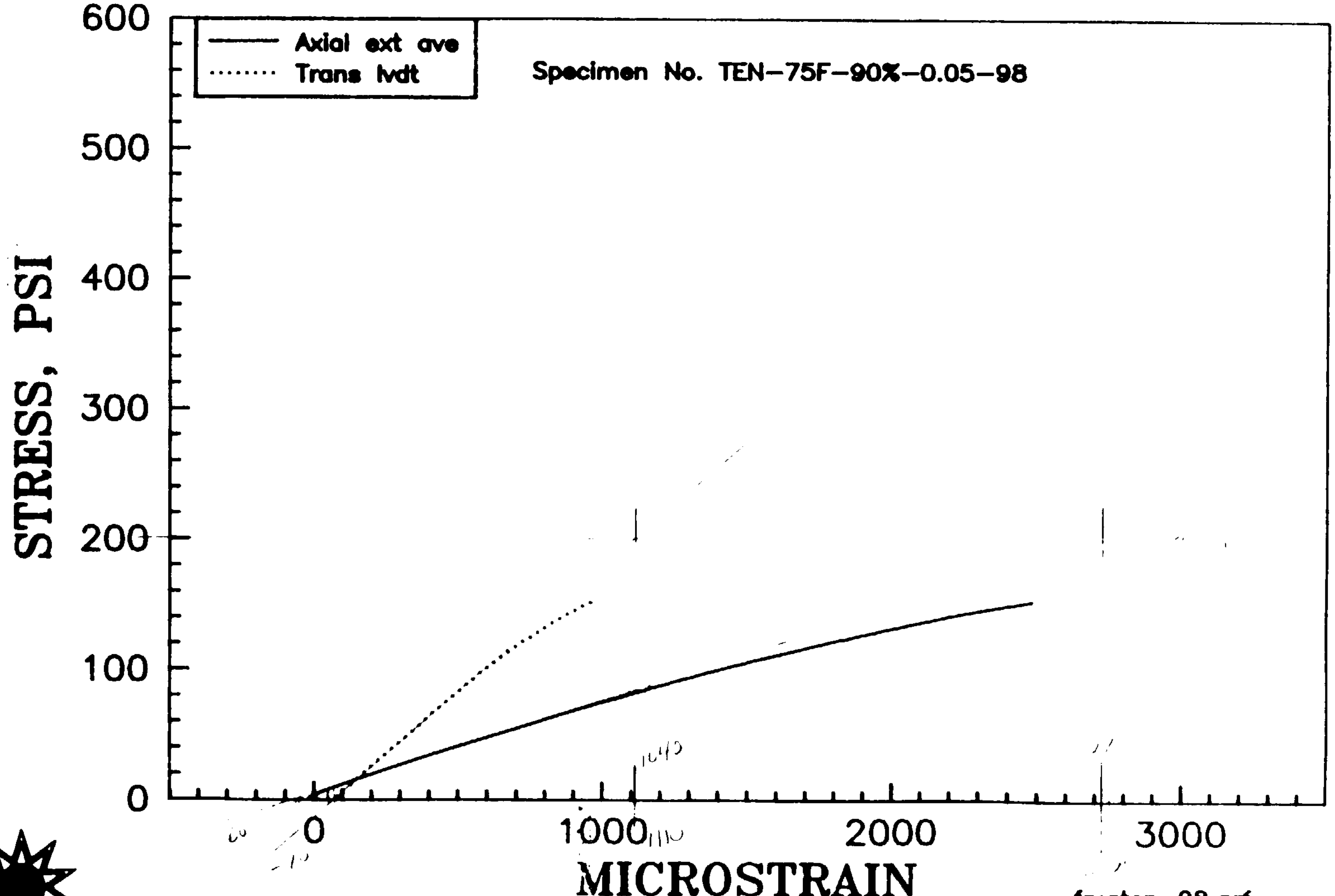
Energy Materials
Testing Laboratory

PVA/MB SOLUBLE CORE TENSION TEST
AGED AT 90°F, 90%RH



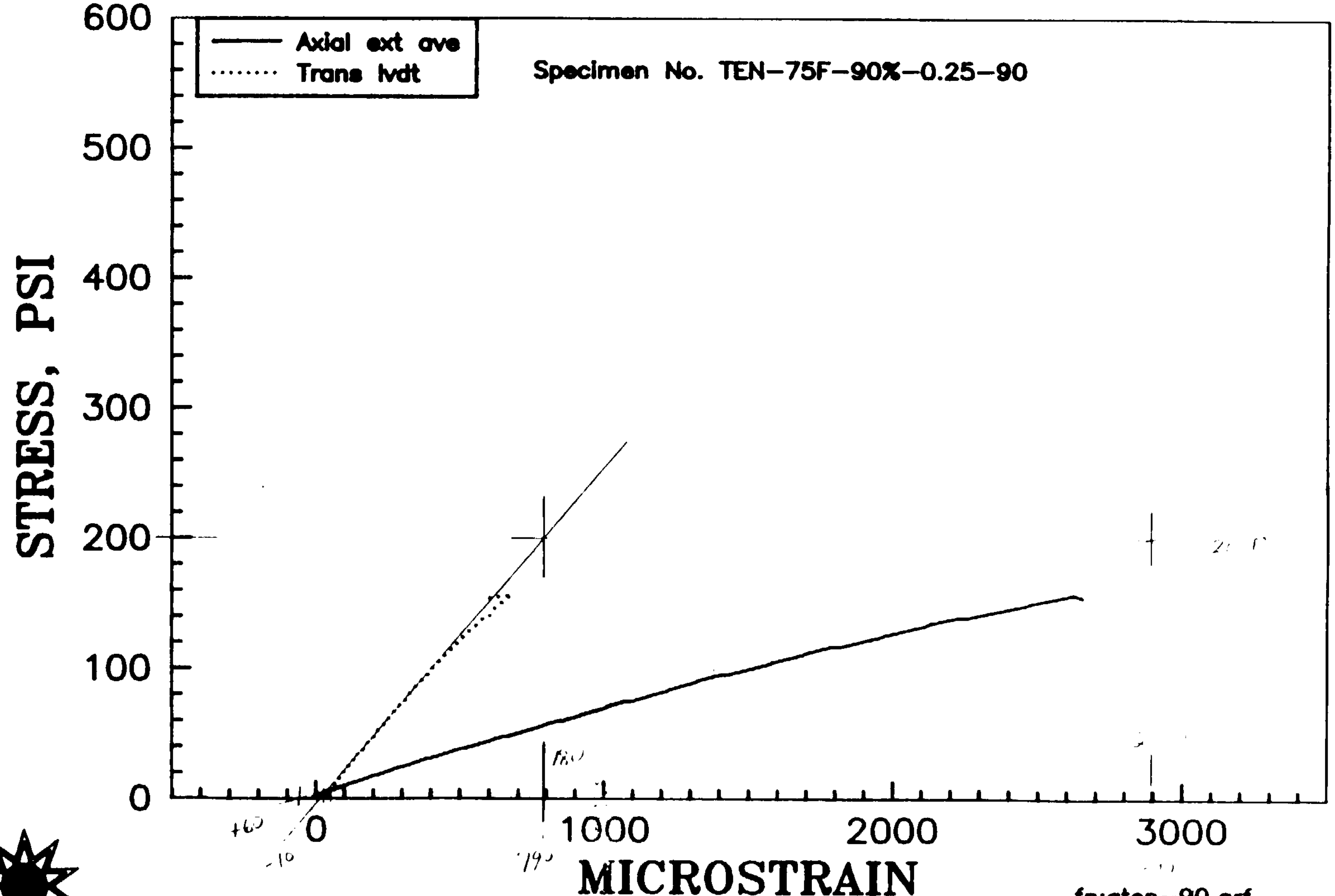
Energy Materials
Testing Laboratory

PVA/MB SOLUBLE CORE TENSION TEST AGED AT 90°F, 90%RH



Energy Materials Testing Laboratory

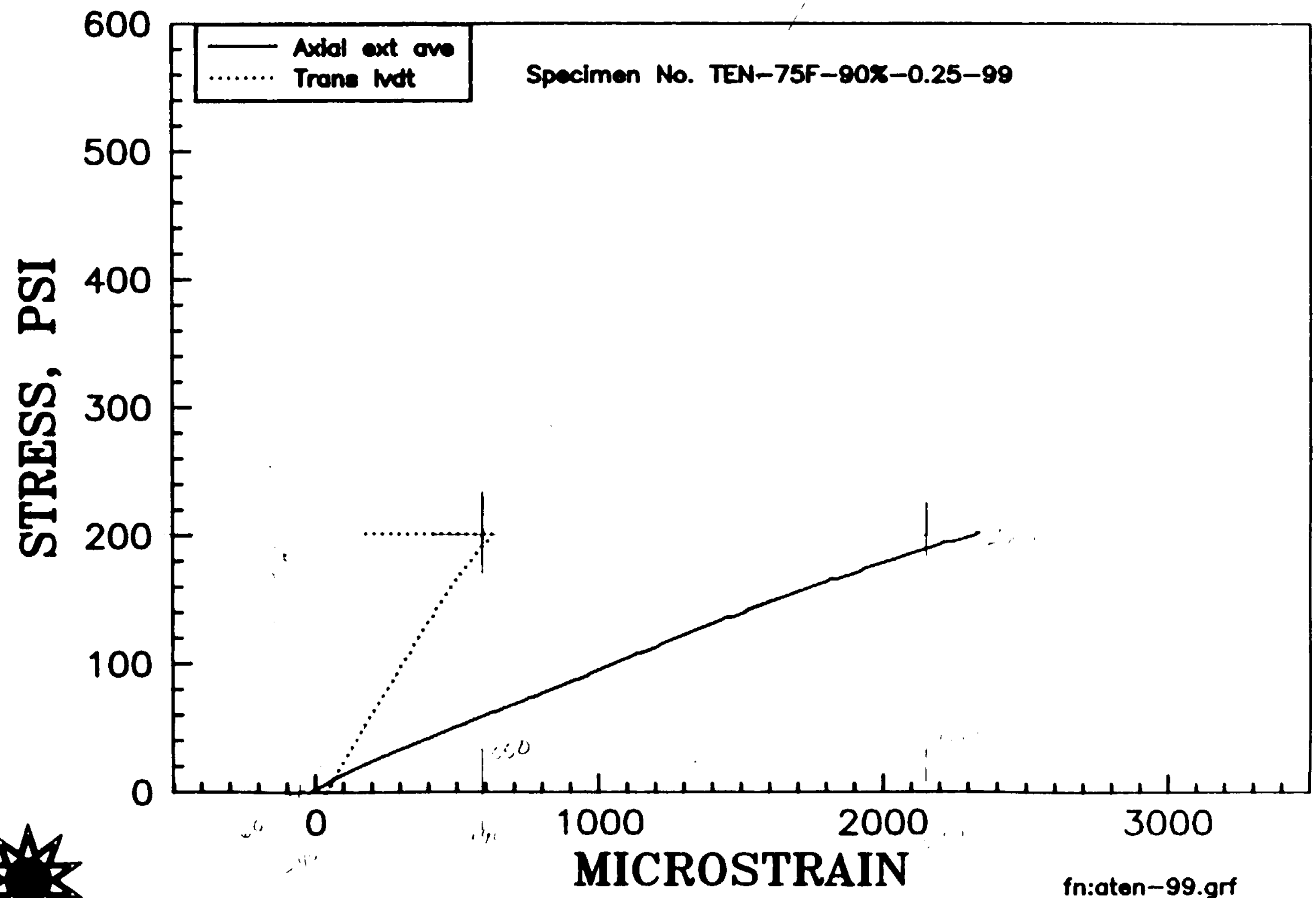
PVA/MB SOLUBLE CORE TENSION TEST
AGED AT 90°F, 90%RH



fn:aten-90.grf

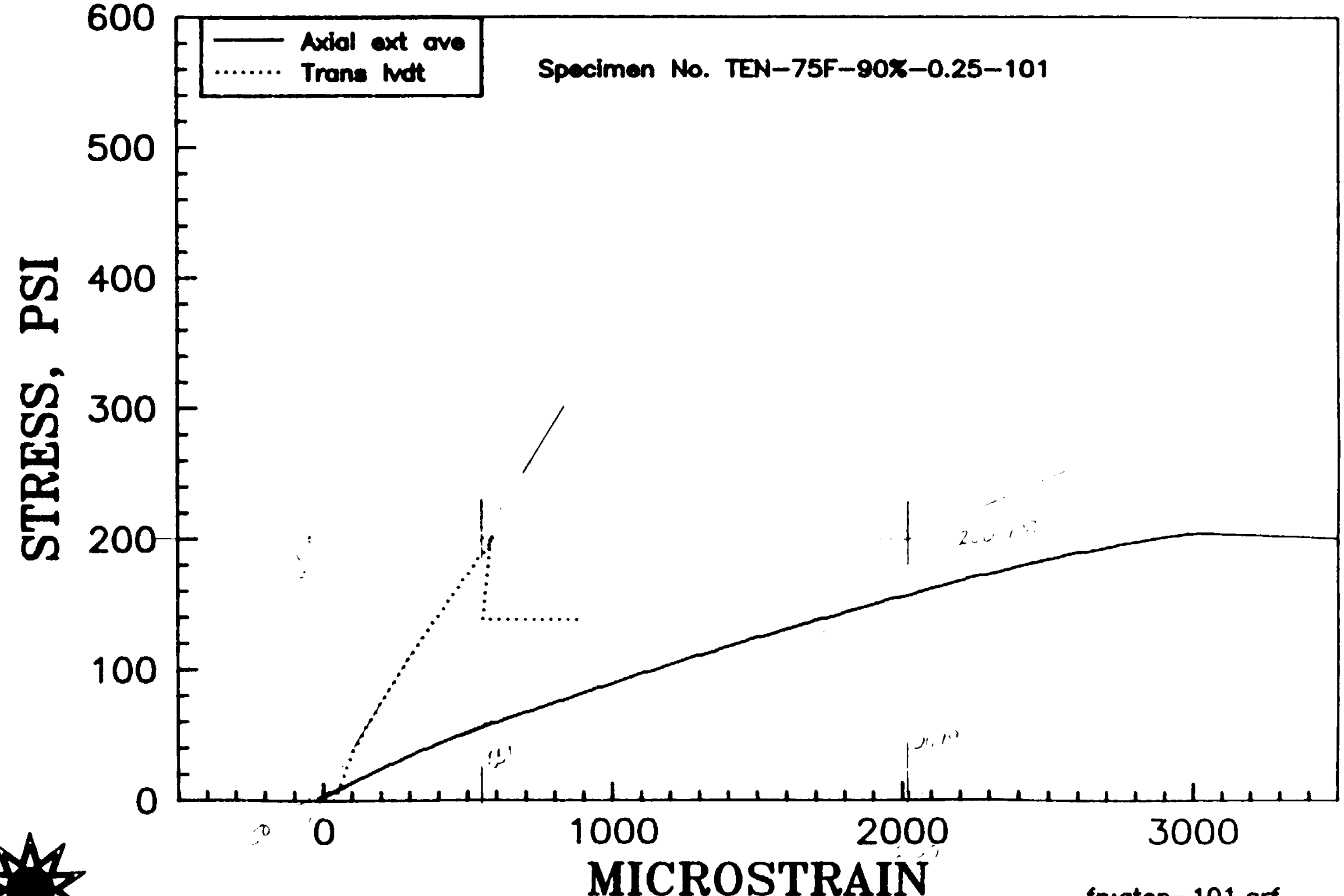
Energy Materials
Testing Laboratory

PVA/MB SOLUBLE CORE TENSION TEST AGED AT 90°F, 90%RH



Energy Materials Testing Laboratory

PVA/MB SOLUBLE CORE TENSION TEST
AGED AT 90°F, 90%RH



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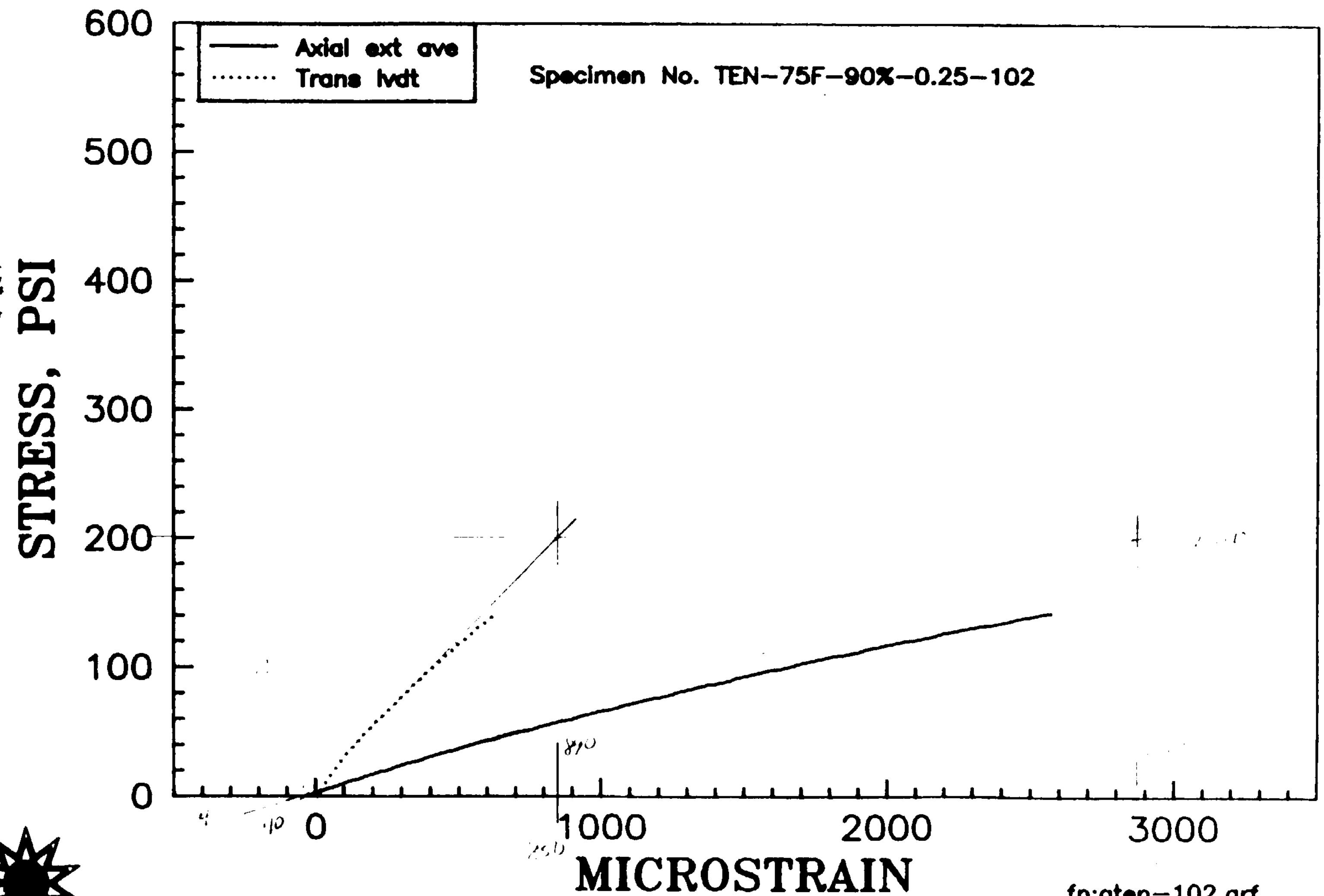
Energy Materials
Testing Laboratory

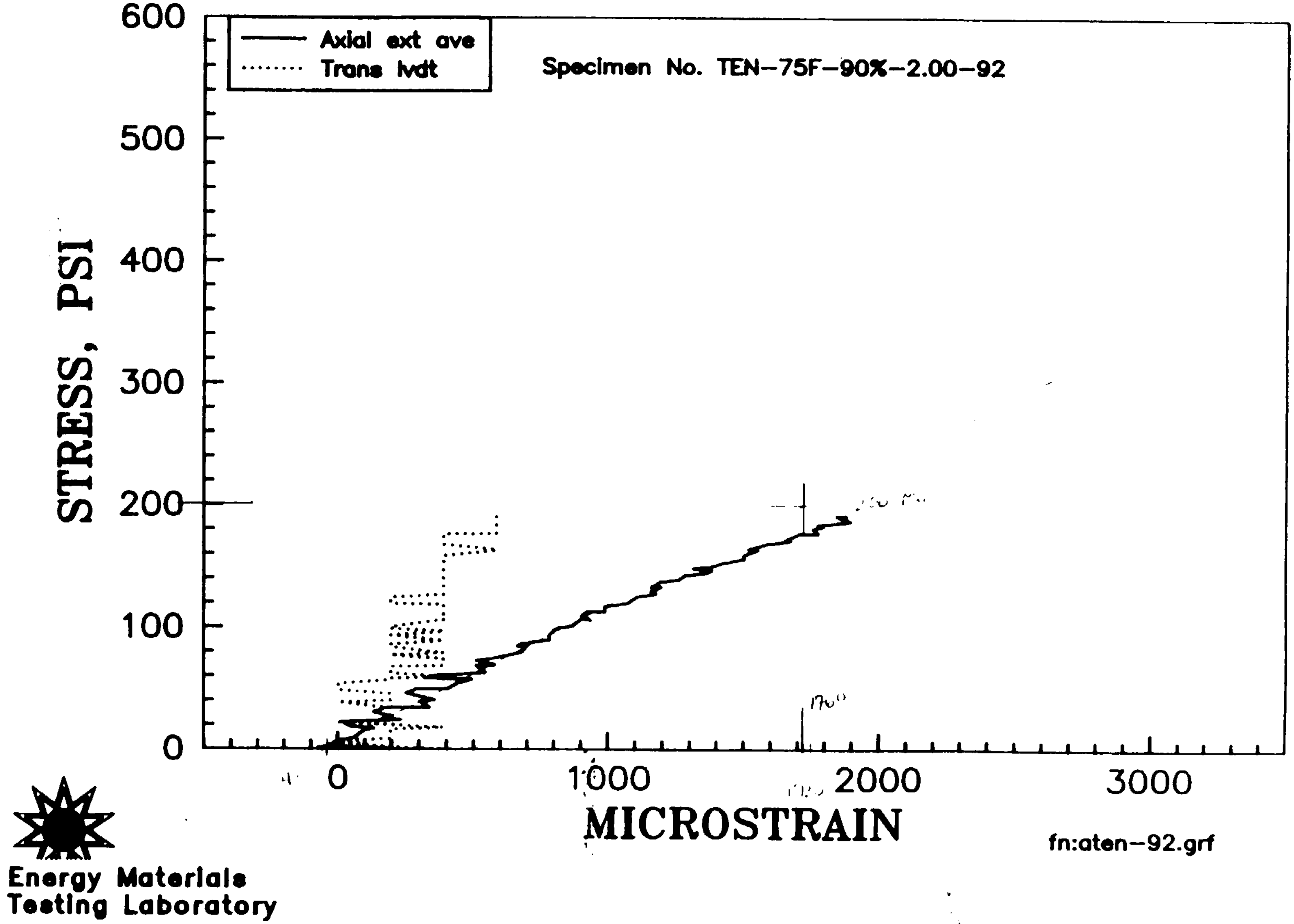
PVA/MB SOLUBLE CORE TENSION TEST AGED AT 90°F, 90%RH



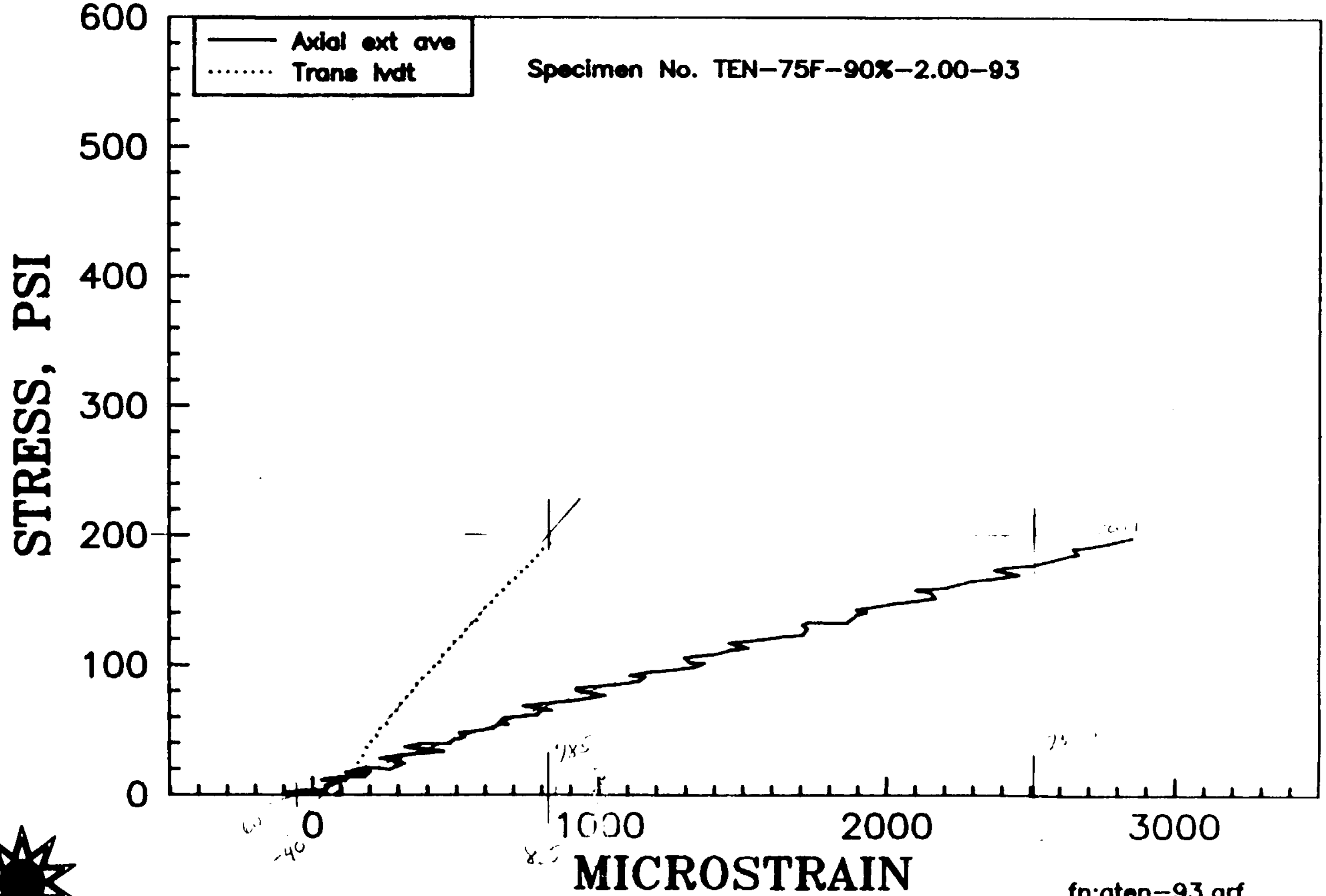
fn:aten-102.grf

Energy Materials Testing Laboratory

PVA/MB SOLUBLE CORE TENSION TEST AGED AT 90°F, 90%RH

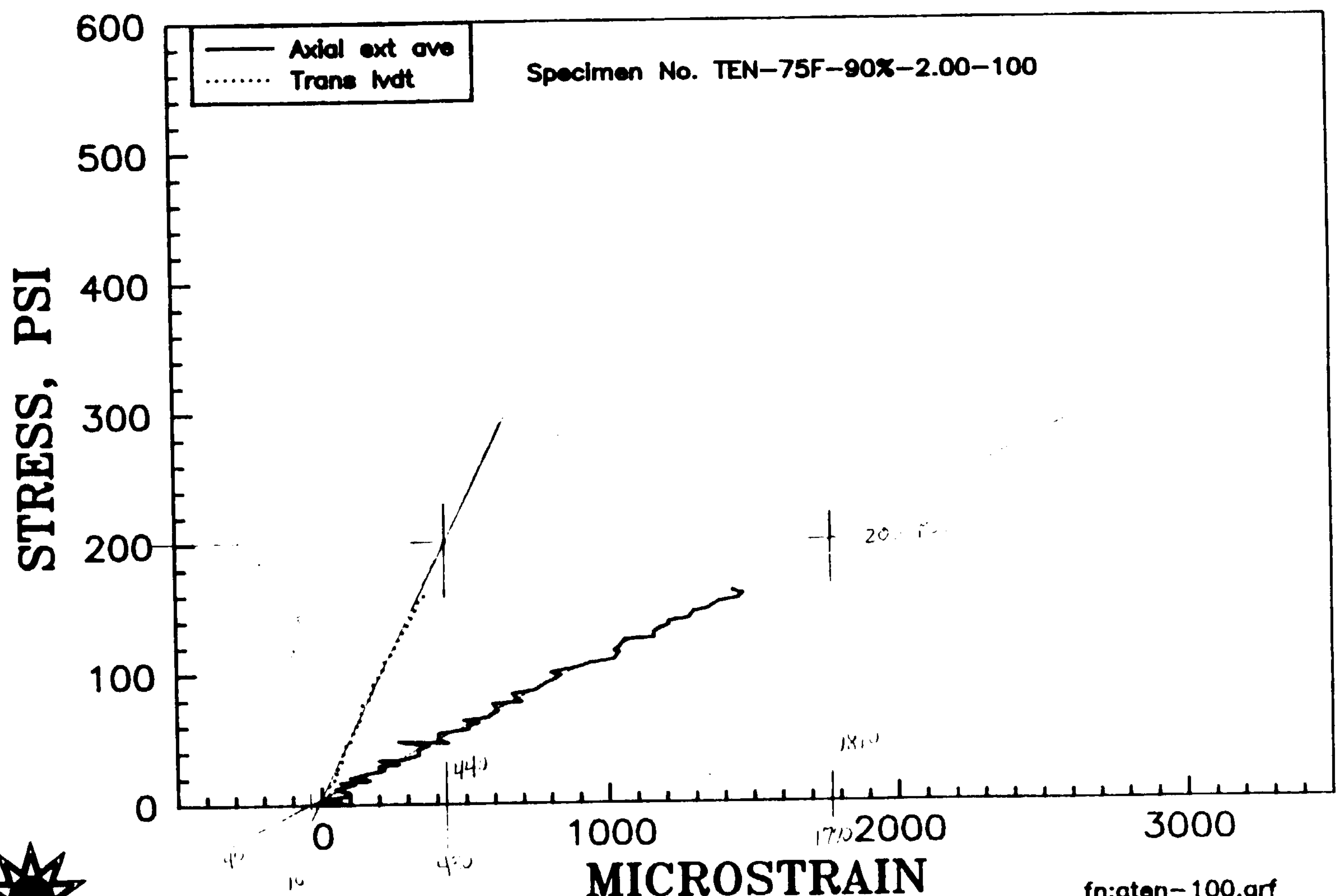


PVA/MB SOLUBLE CORE TENSION TEST
AGED AT 90°F, 90%RH



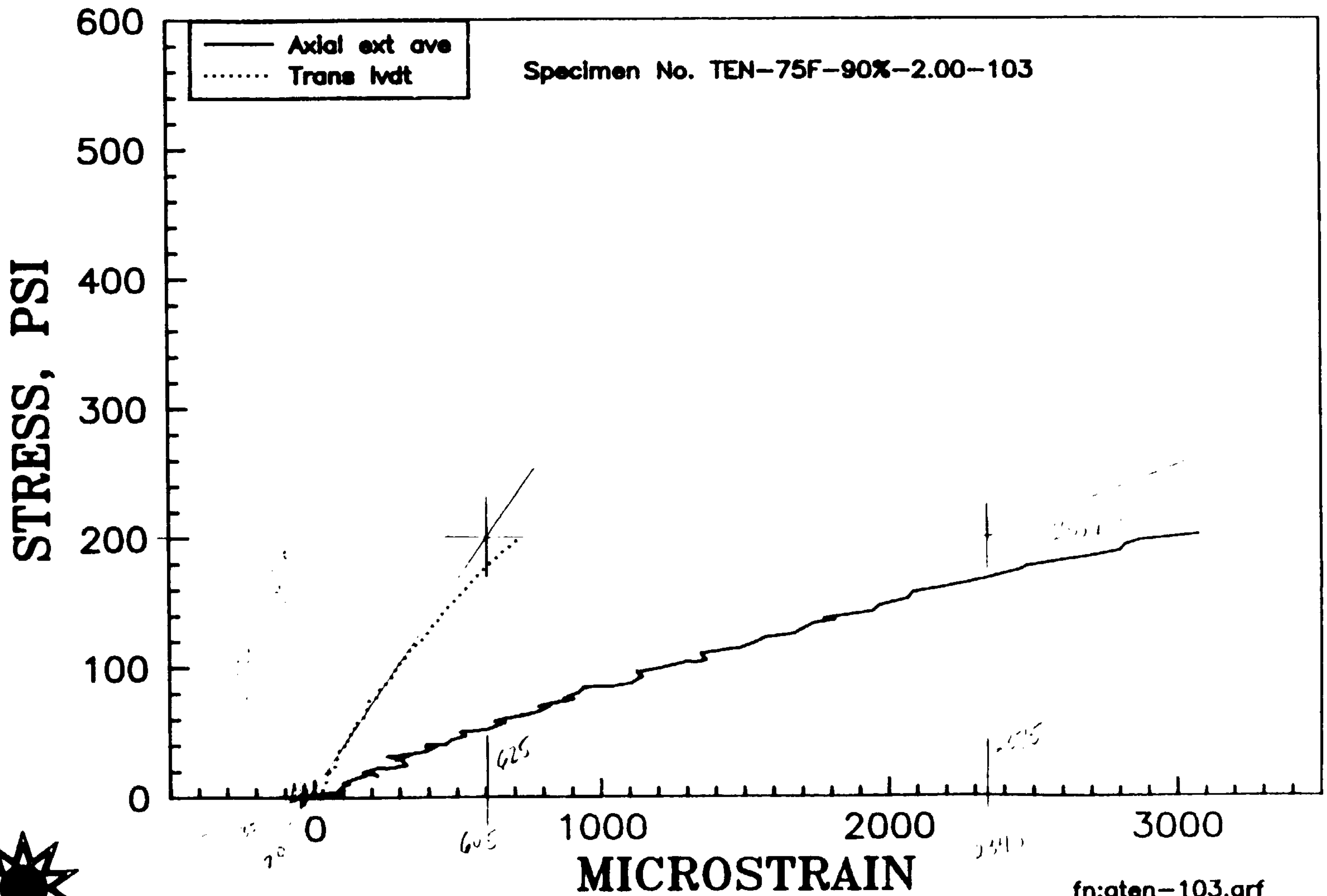
Energy Materials Testing Laboratory

PVA/MB SOLUBLE CORE TENSION TEST AGED AT 90°F, 90%RH



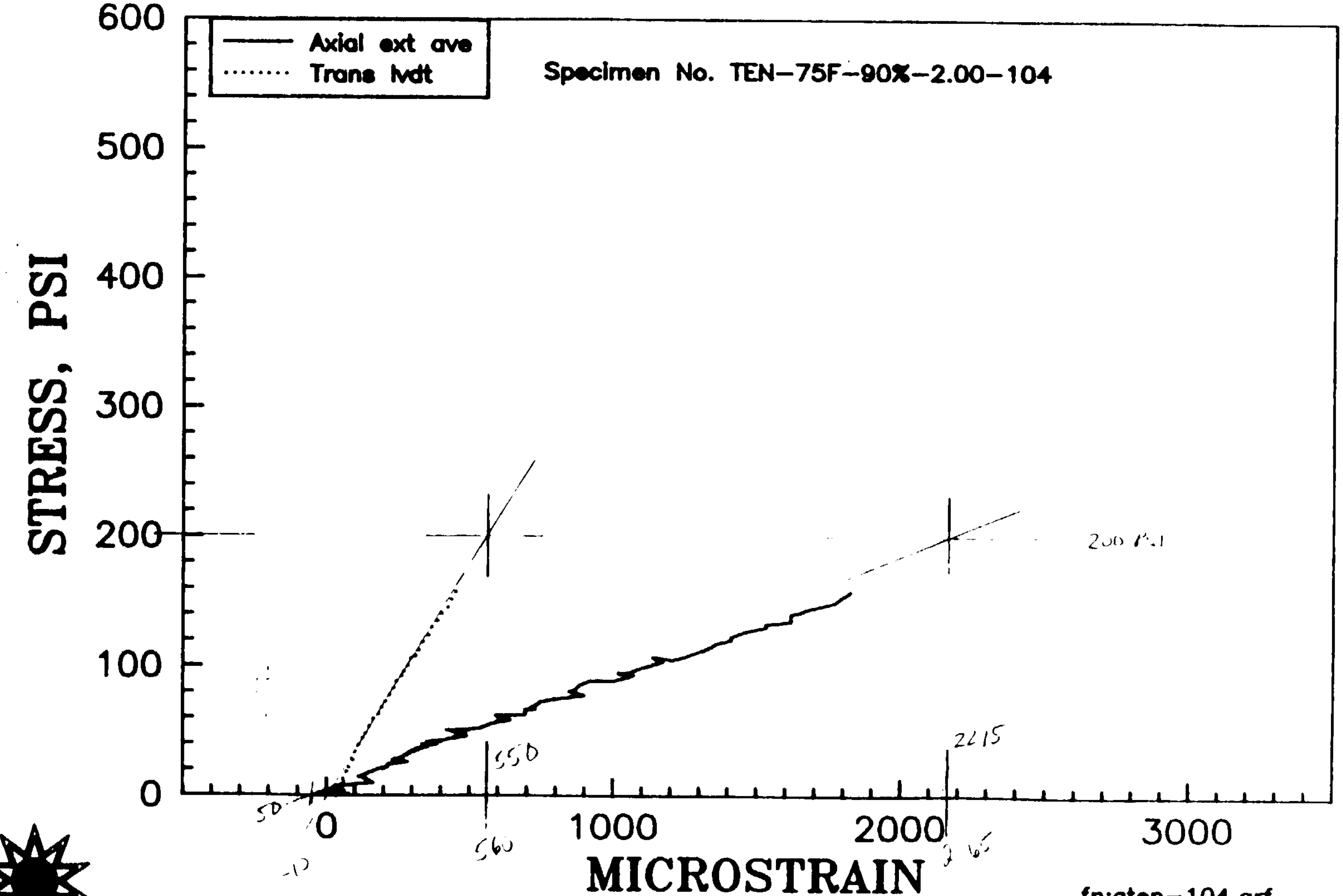
Energy Materials Testing Laboratory

PVA/MB SOLUBLE CORE TENSION TEST
AGED AT 90°F, 90%RH



Energy Materials
Testing Laboratory

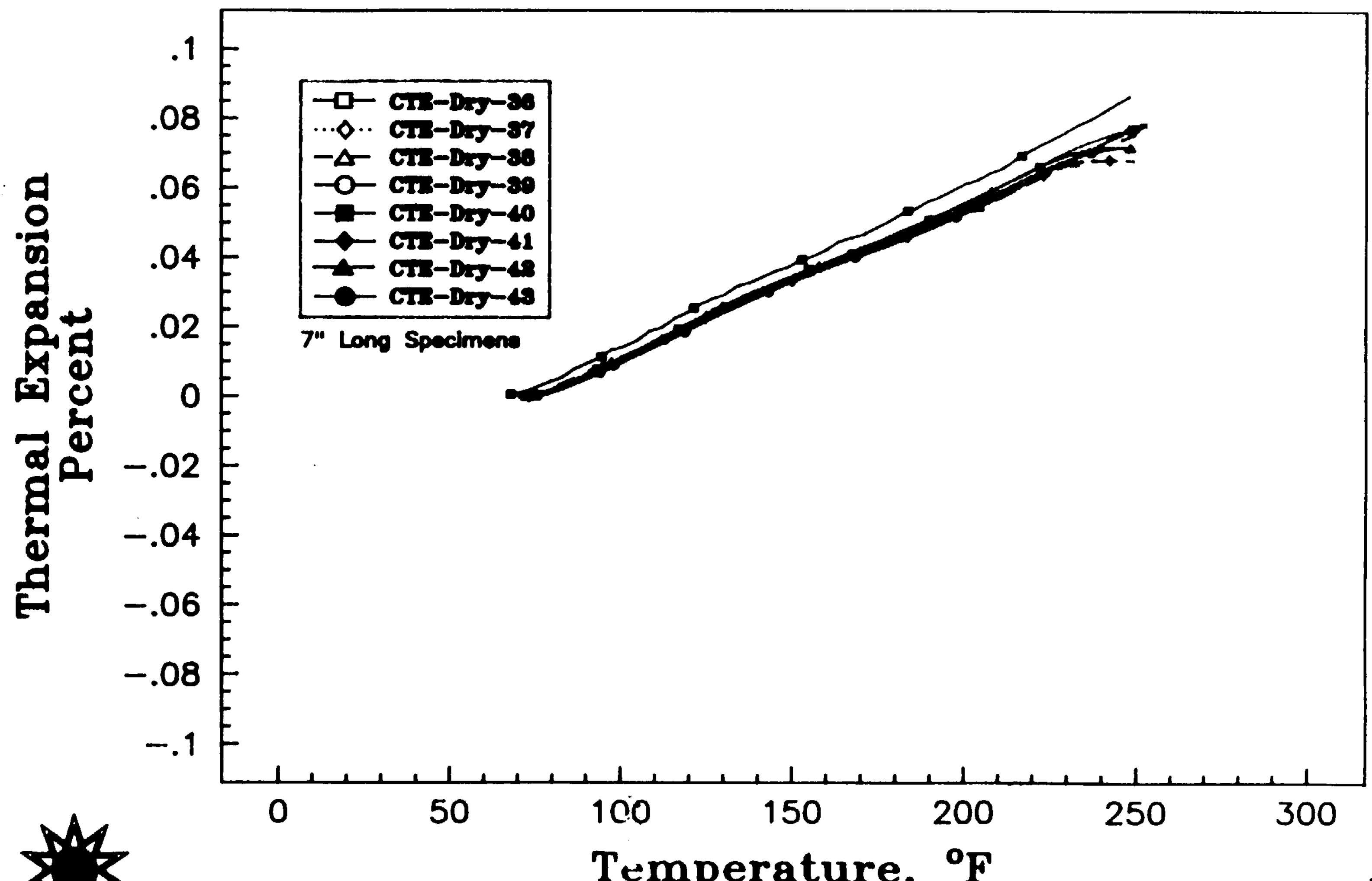
PVA/MB SOLUBLE CORE TENSION TEST
AGED AT 90°F, 90%RH



Energy Materials
Testing Laboratory

INDIVIDUAL CTE CURVES
(RAW DATA)

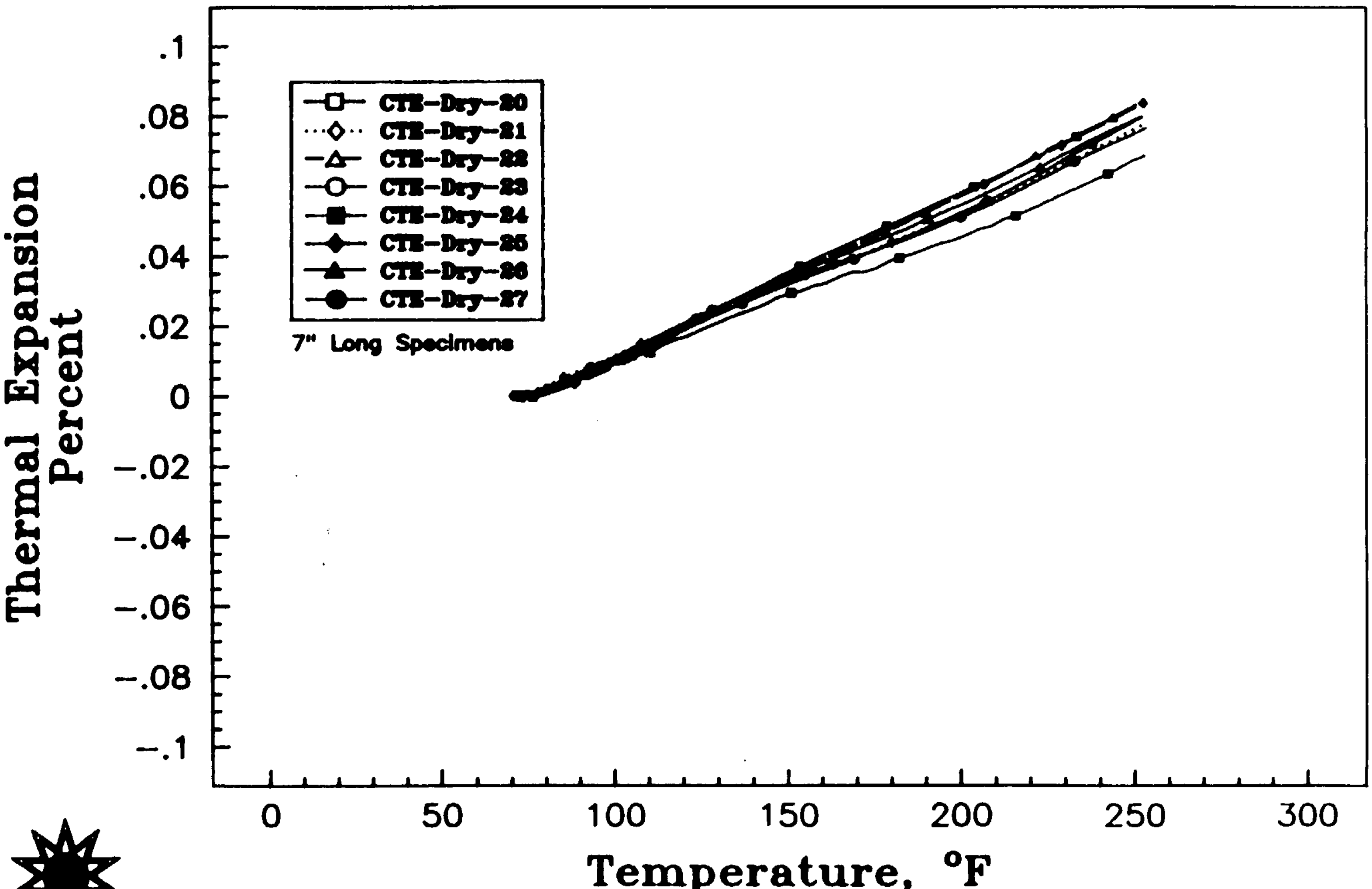
PVA/MB SOLUBLE CORE THERMAL EXPANSION TEST
BASELINE SAMPLES; NO HIGH HUMIDITY AGING



Energy Materials Testing Laboratory

7inBaseln.grf

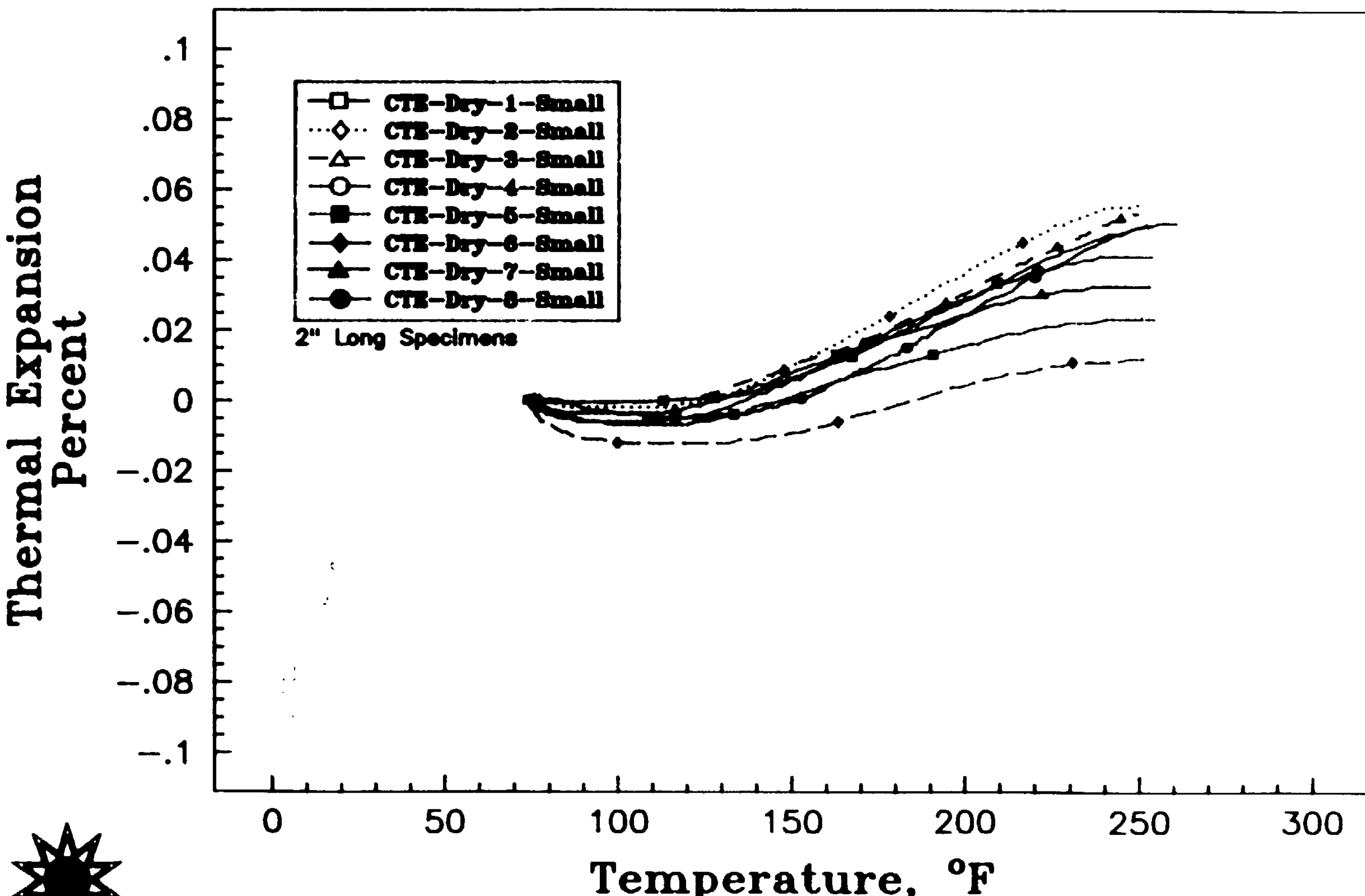
PVA/MB SOLUBLE CORE THERMAL EXPANSION TEST AGED AT 90°F, 90% RH; THEN DRIED AT 180°F



Energy Materials Testing Laboratory

180Fdried.grf

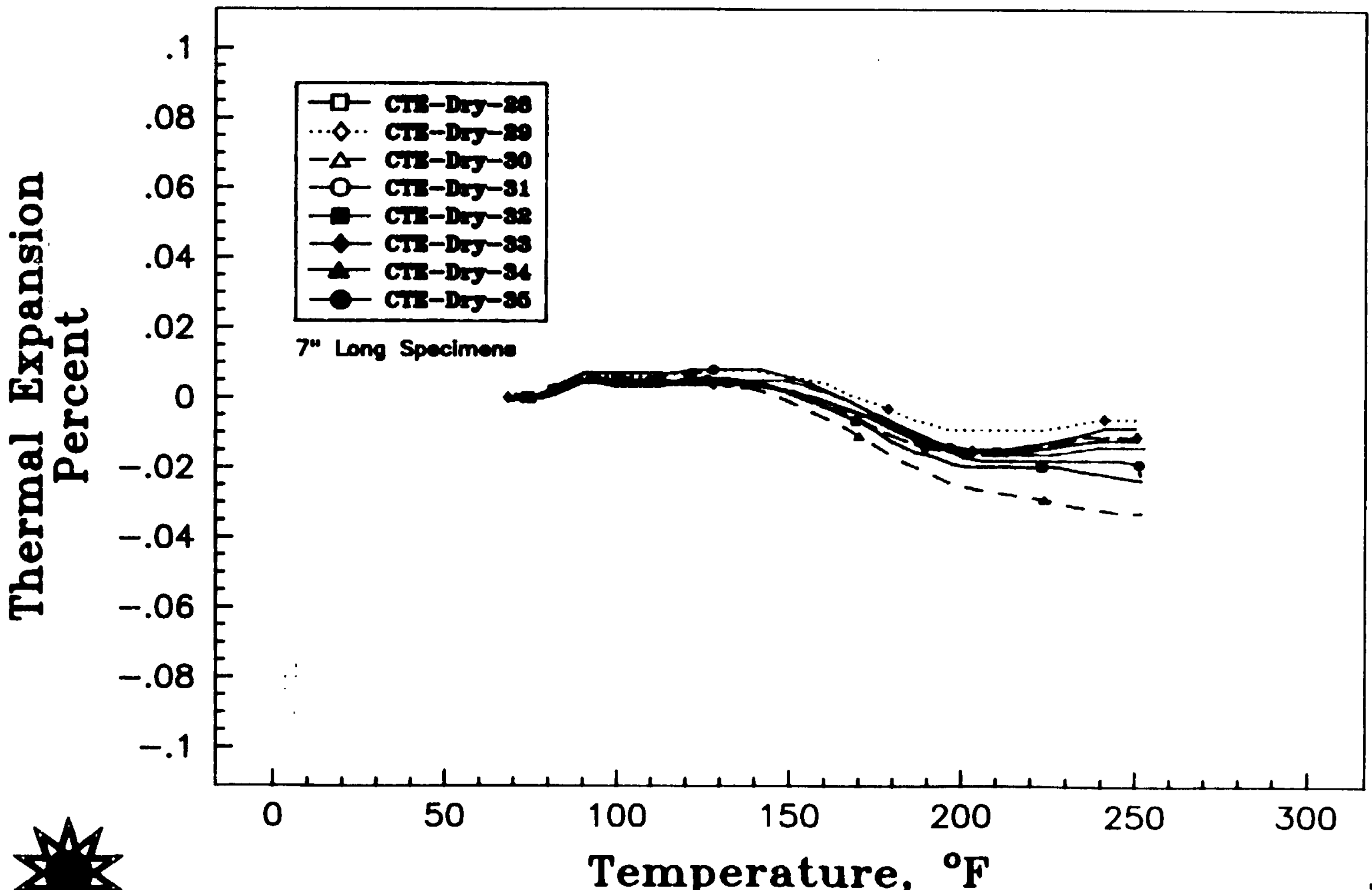
PVA/MB SOLUBLE CORE THERMAL EXPANSION TEST CORRELATION BASELINE; NO HIGH HUMIDITY AGING



CTEdrycomp

Energy Materials Testing Laboratory

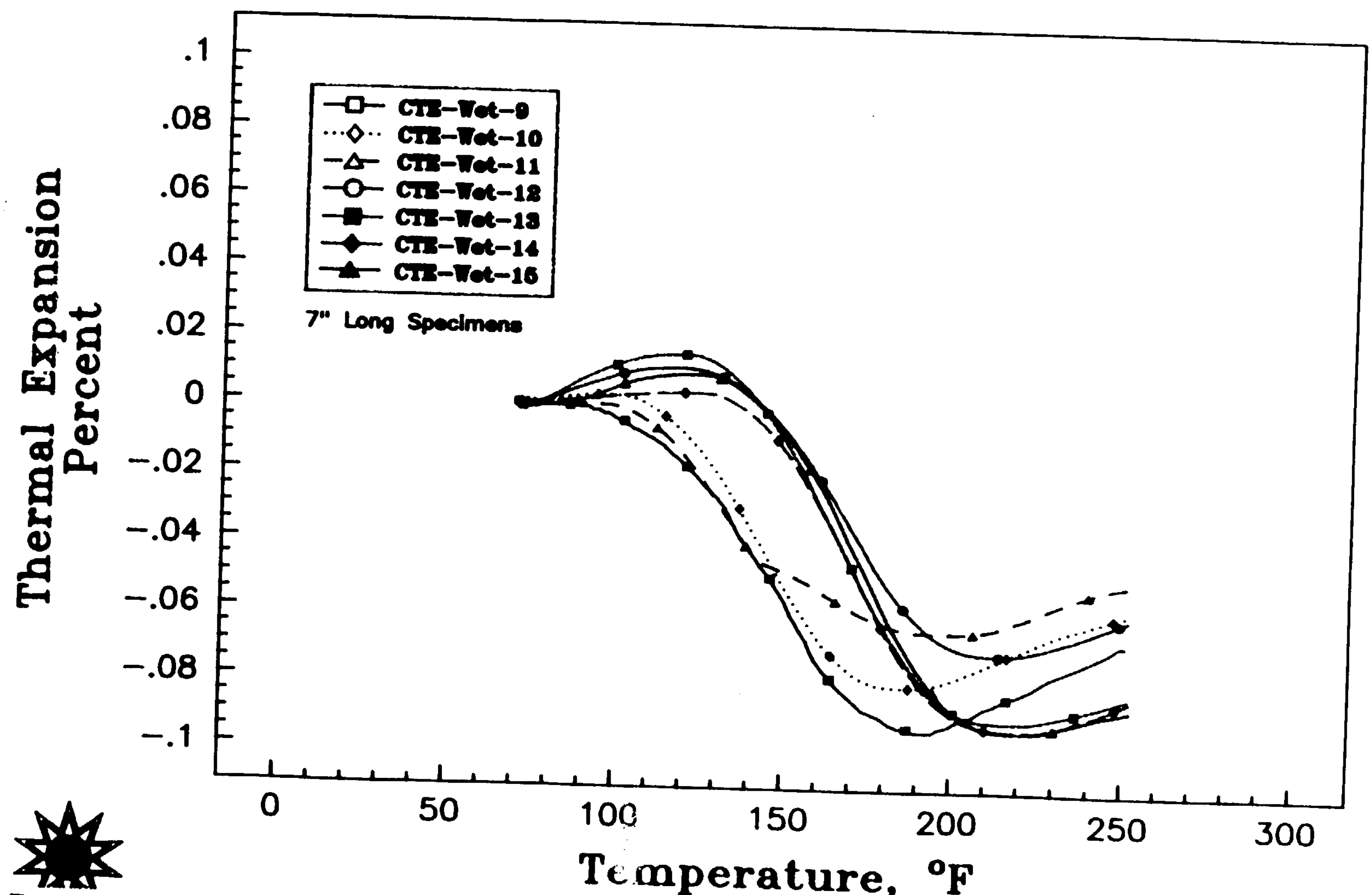
PVA/MB SOLUBLE CORE THERMAL EXPANSION TEST
AGED AT 70°F, 50% RH



Energy Materials Testing Laboratory

70F50RHsum

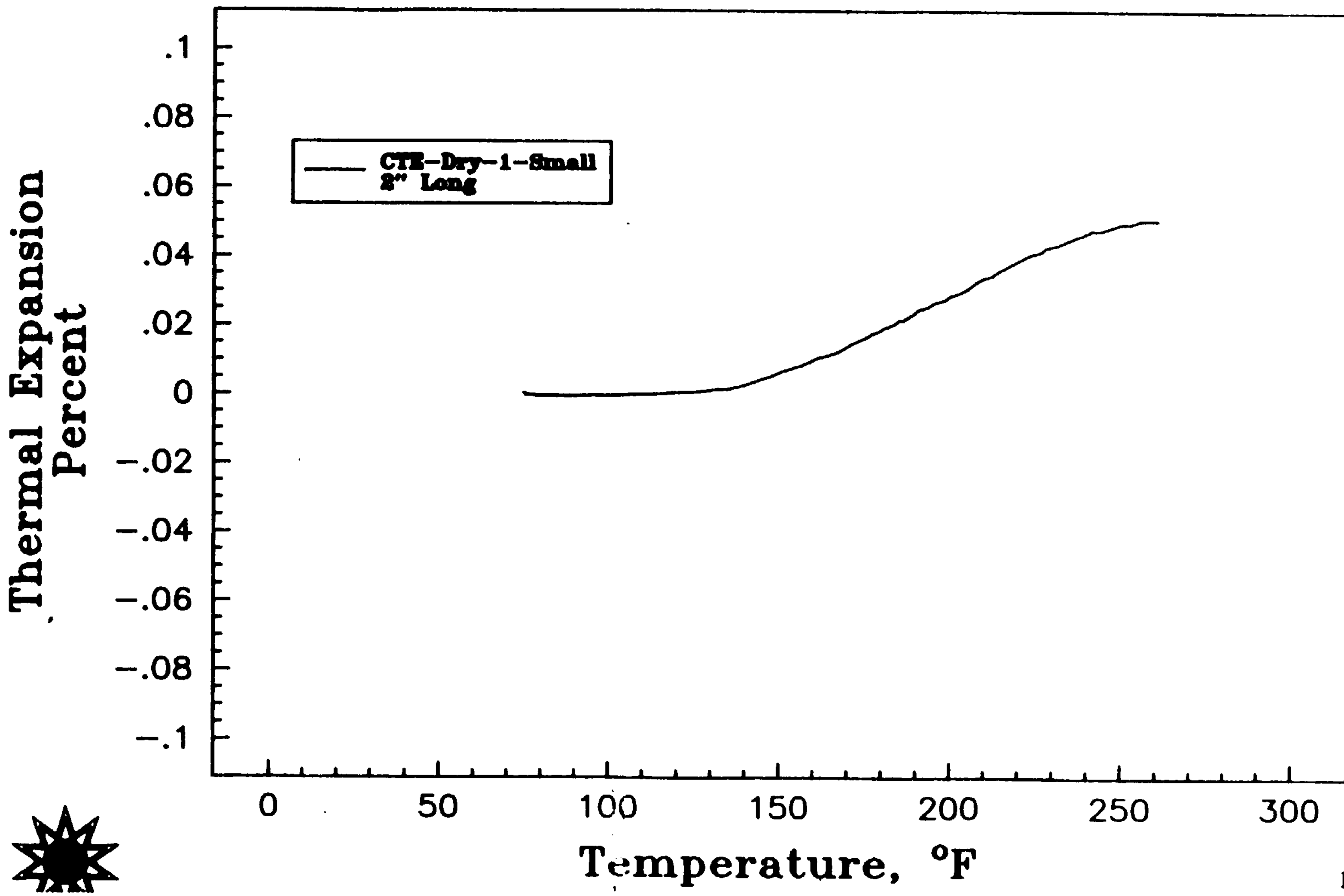
PVA/MB SOLUBLE CORE THERMAL EXPANSION TEST AGED AT 90°F, 90% RH



Energy Materials Testing Laboratory

wetsum

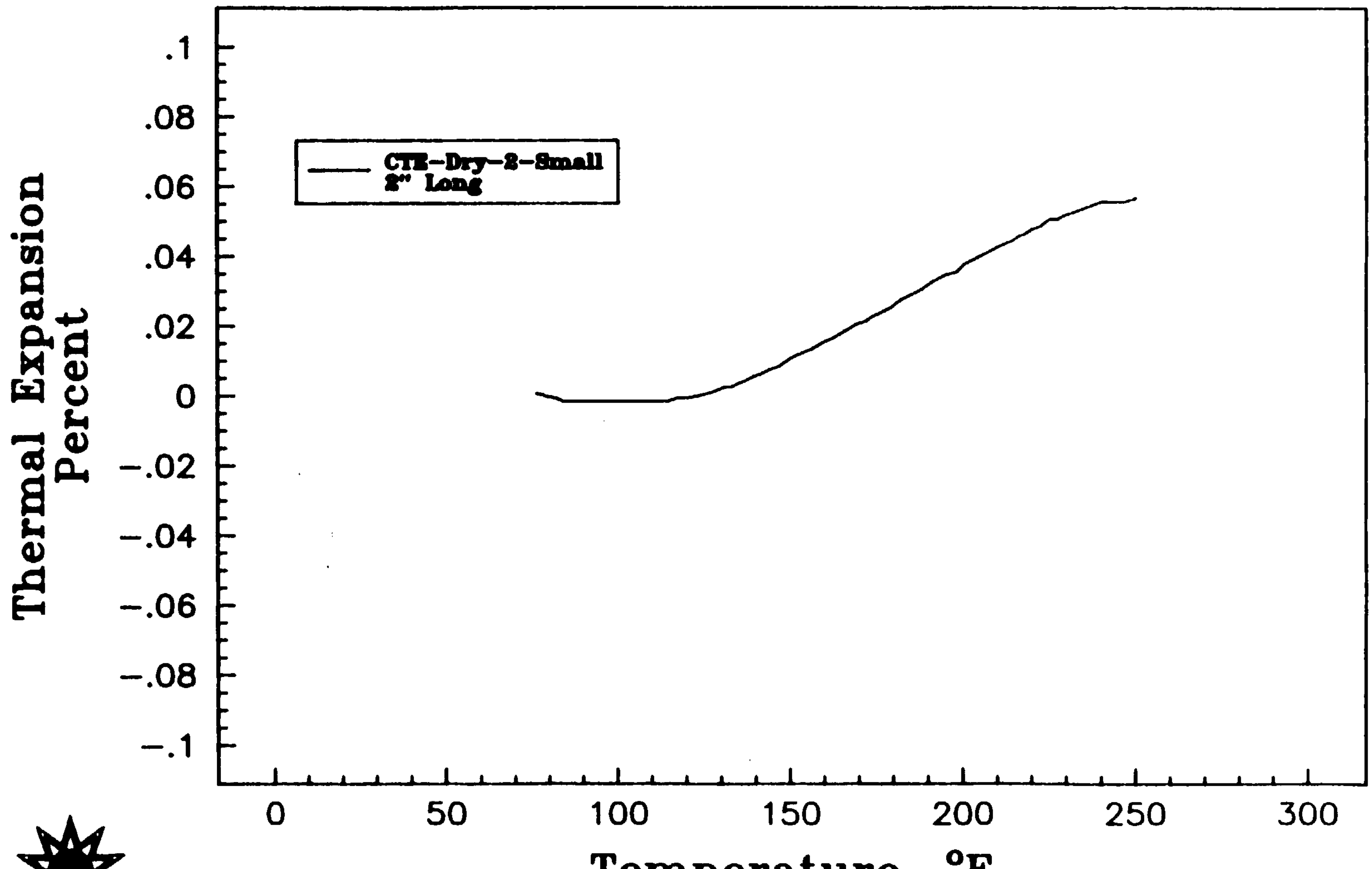
PVA/MB SOLUBLE CORE THERMAL EXPANSION TEST CORRELATION BASELINE; NO HIGH HUMIDITY AGING



Energy Materials Testing Laboratory

LE-2984.grf

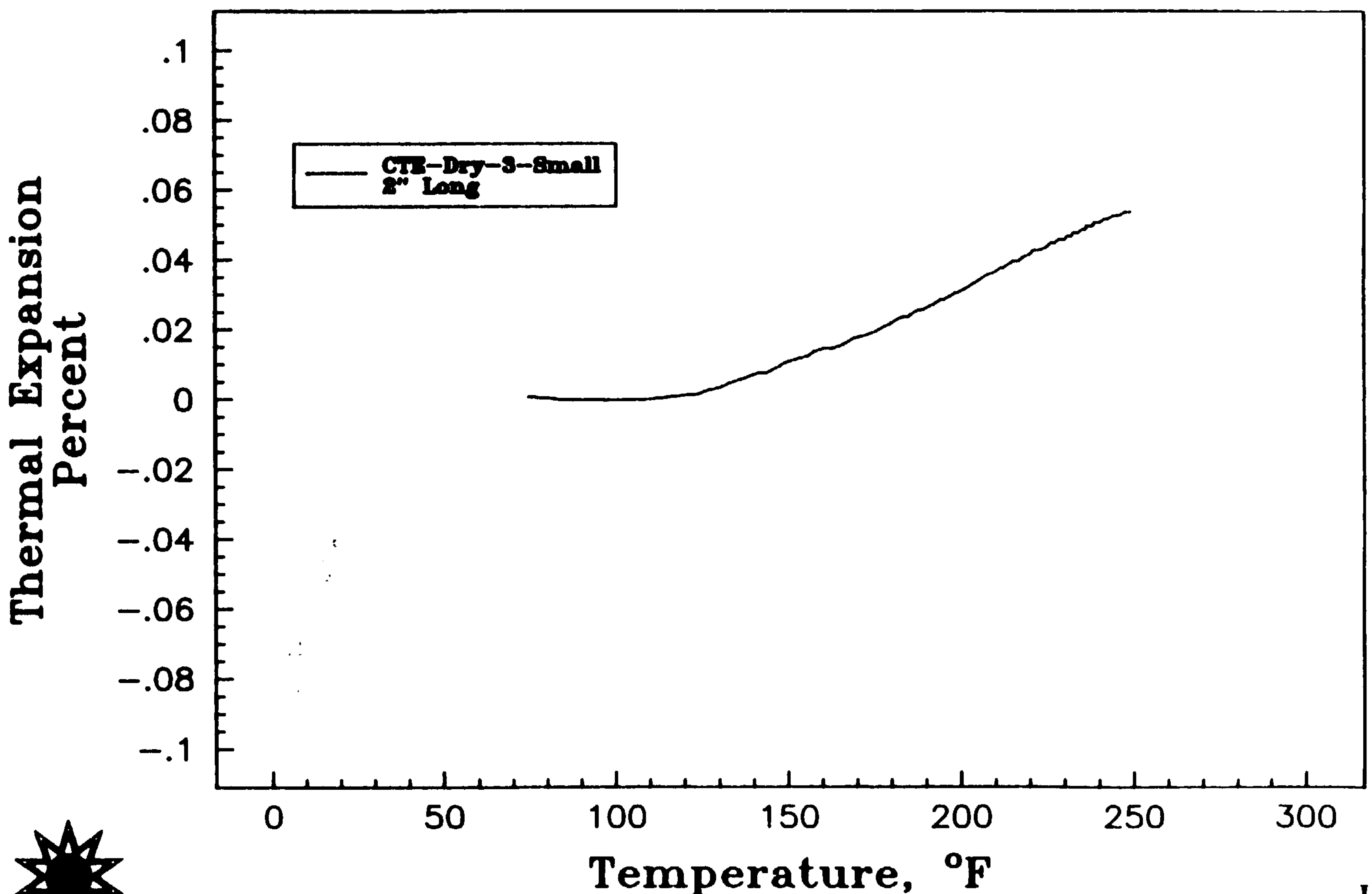
PVA/MB SOLUBLE CORE THERMAL EXPANSION TEST CORRELATION BASELINE; NO HIGH HUMIDITY AGING



Energy Materials Testing Laboratory

LE−2985.grf

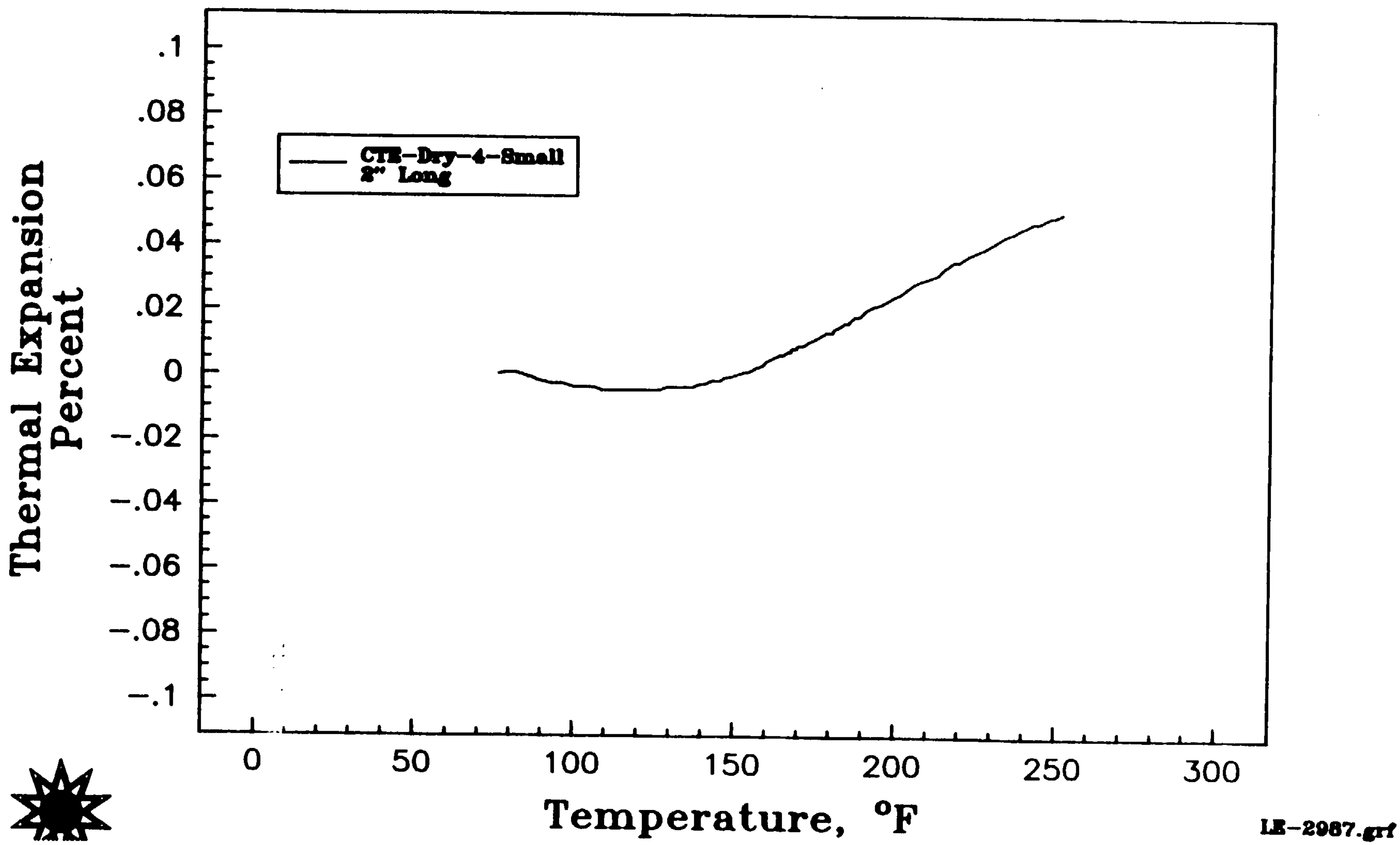
PVA/MB SOLUBLE CORE THERMAL EXPANSION TEST CORRELATION BASELINE; NO HIGH HUMIDITY AGING



LE-2986.grf

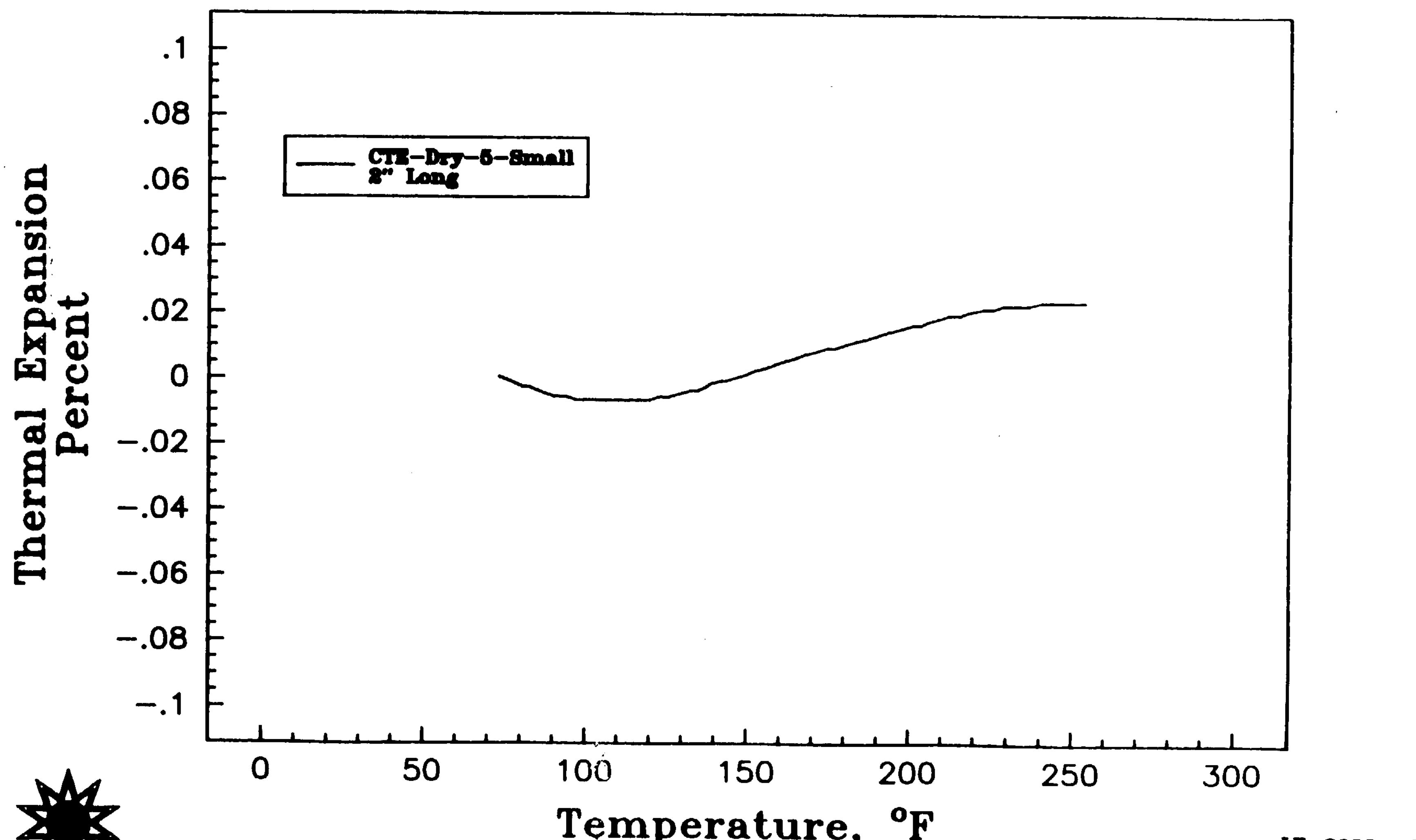
Energy Materials Testing Laboratory

PVA/MB SOLUBLE CORE THERMAL EXPANSION TEST CORRELATION BASELINE; NO HIGH HUMIDITY AGING



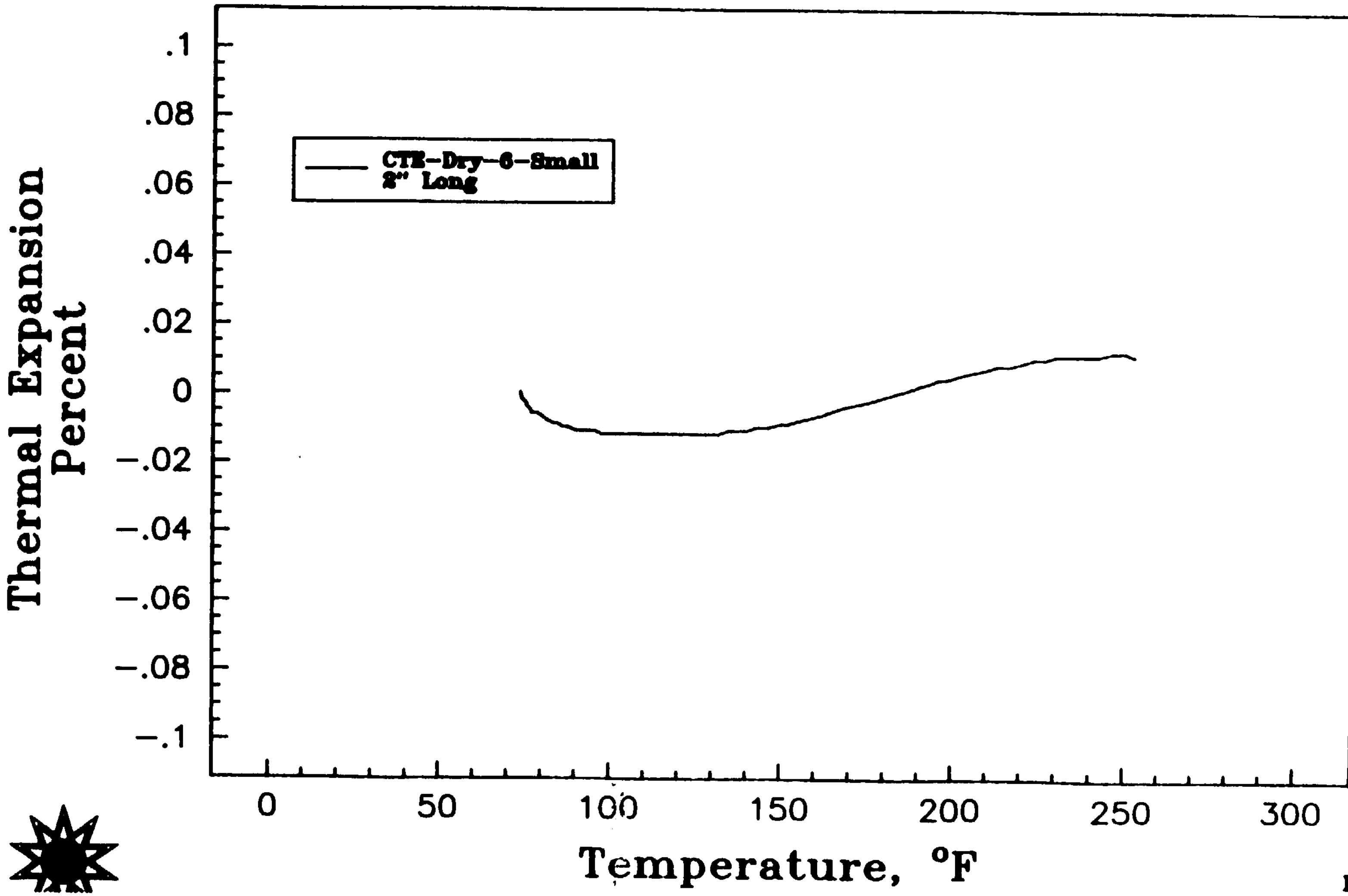
Energy Materials
Testing Laboratory

PVA/MB SOLUBLE CORE THERMAL EXPANSION TEST CORRELATION BASELINE; NO HIGH HUMIDITY AGING



Energy Materials Testing Laboratory

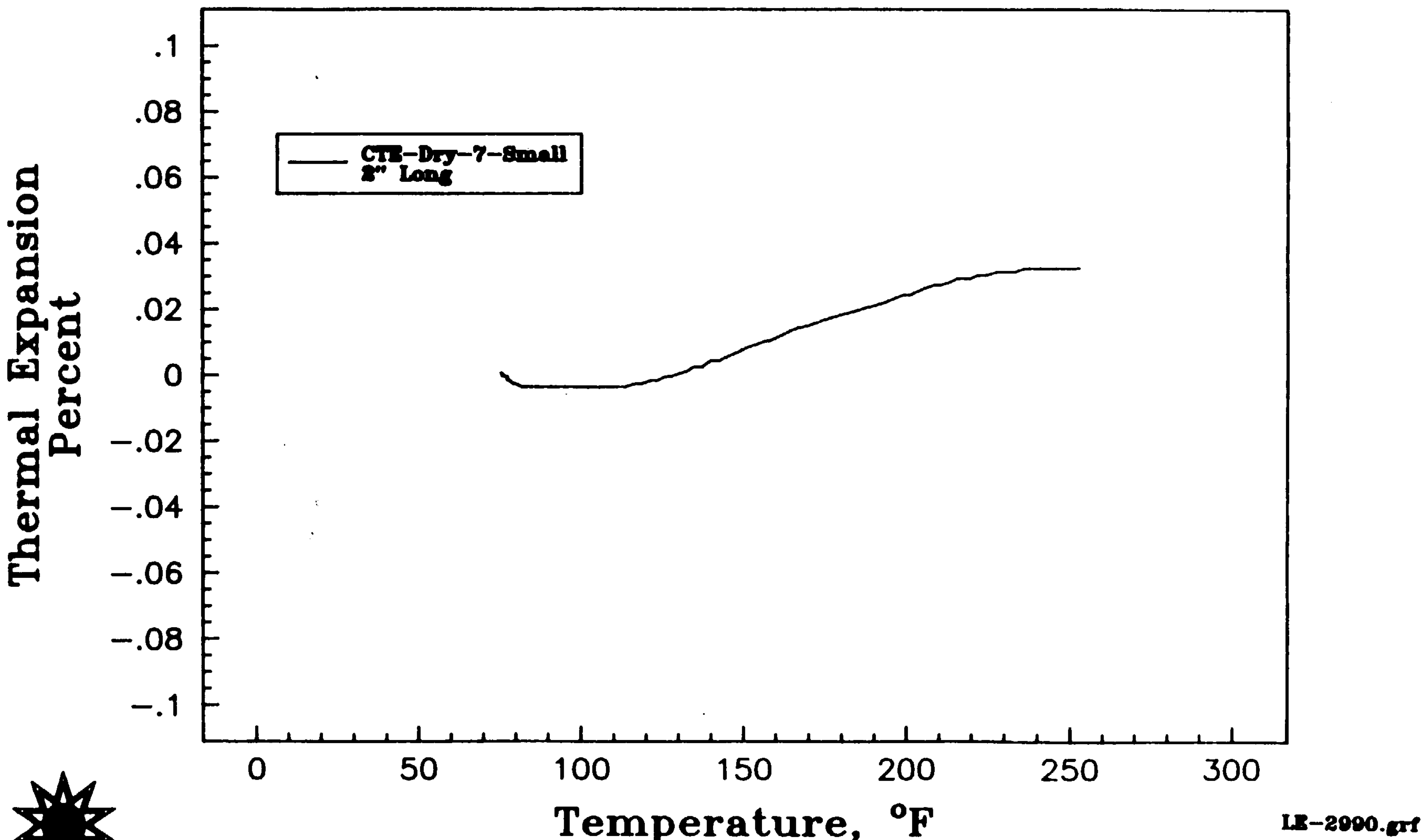
PVA/MB SOLUBLE CORE THERMAL EXPANSION TEST CORRELATION BASELINE; NO HIGH HUMIDITY AGING



Energy Materials
Testing Laboratory

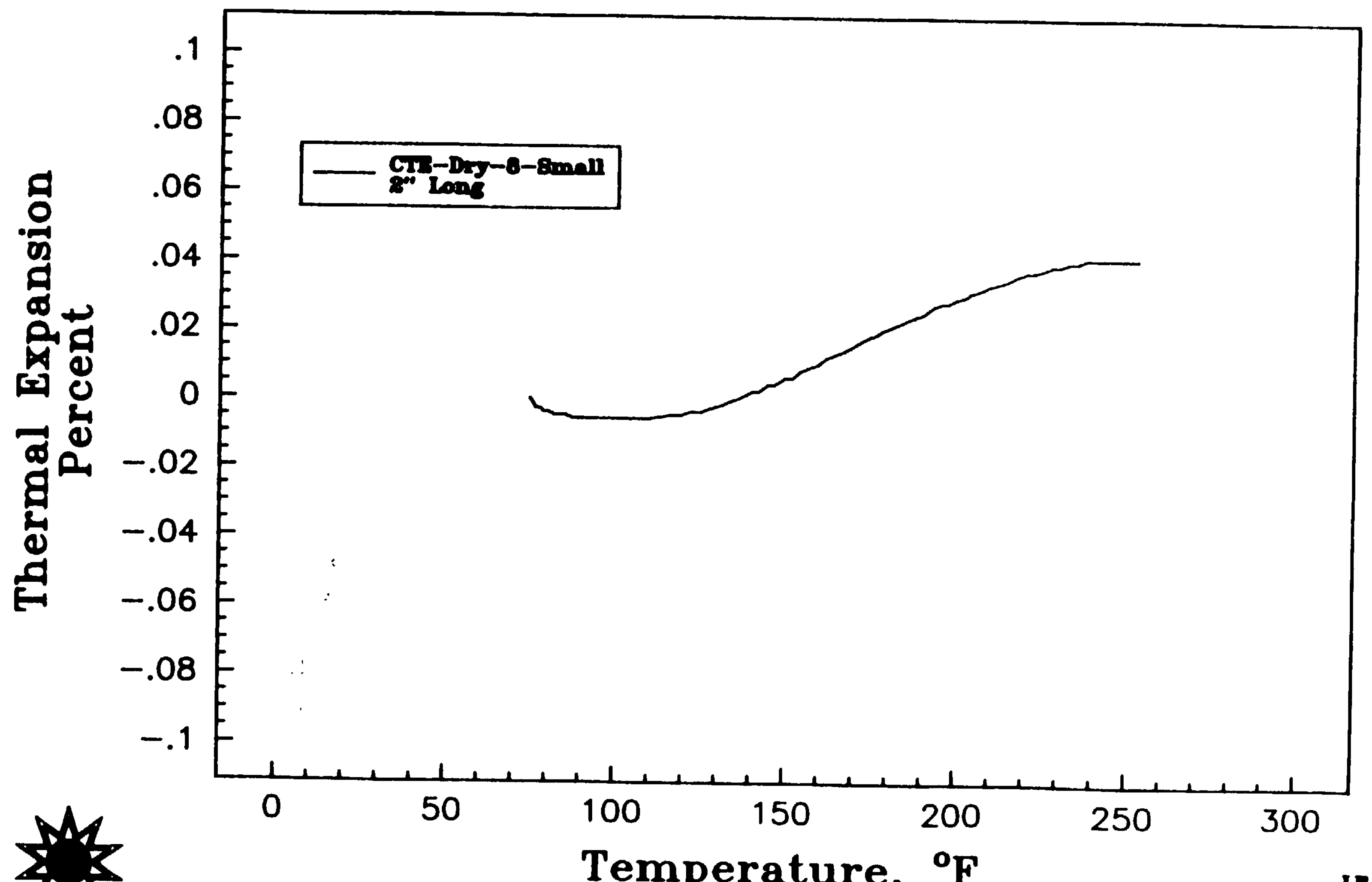
LE-2989.grf

PVA/MB SOLUBLE CORE THERMAL EXPANSION TEST CORRELATION BASELINE; NO HIGH HUMIDITY AGING



Energy Materials Testing Laboratory

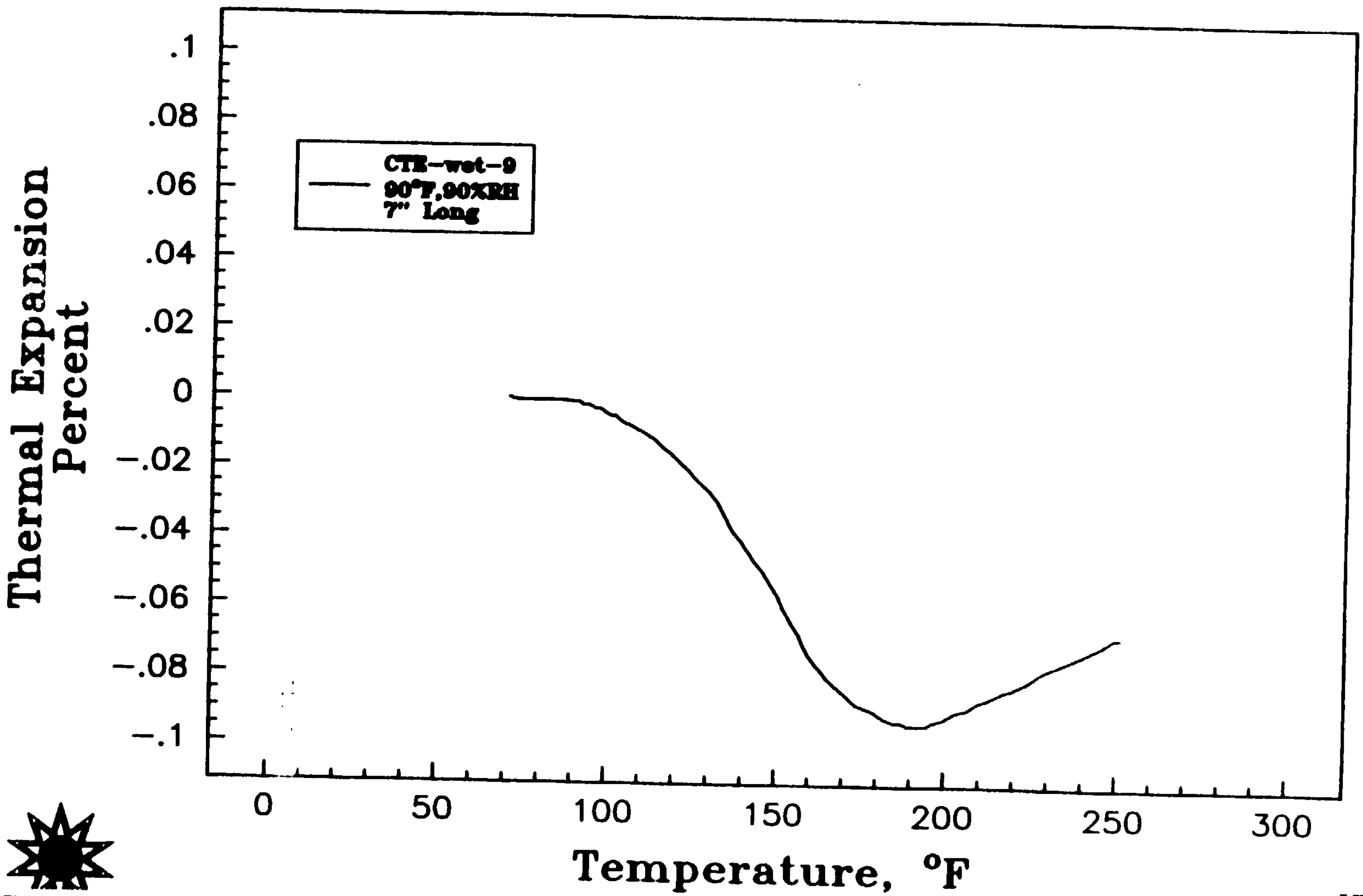
PVA/MB SOLUBLE CORE THERMAL EXPANSION TEST CORRELATION BASELINE; NO HIGH HUMIDITY AGING



Energy Materials Testing Laboratory

LE-2991.grf

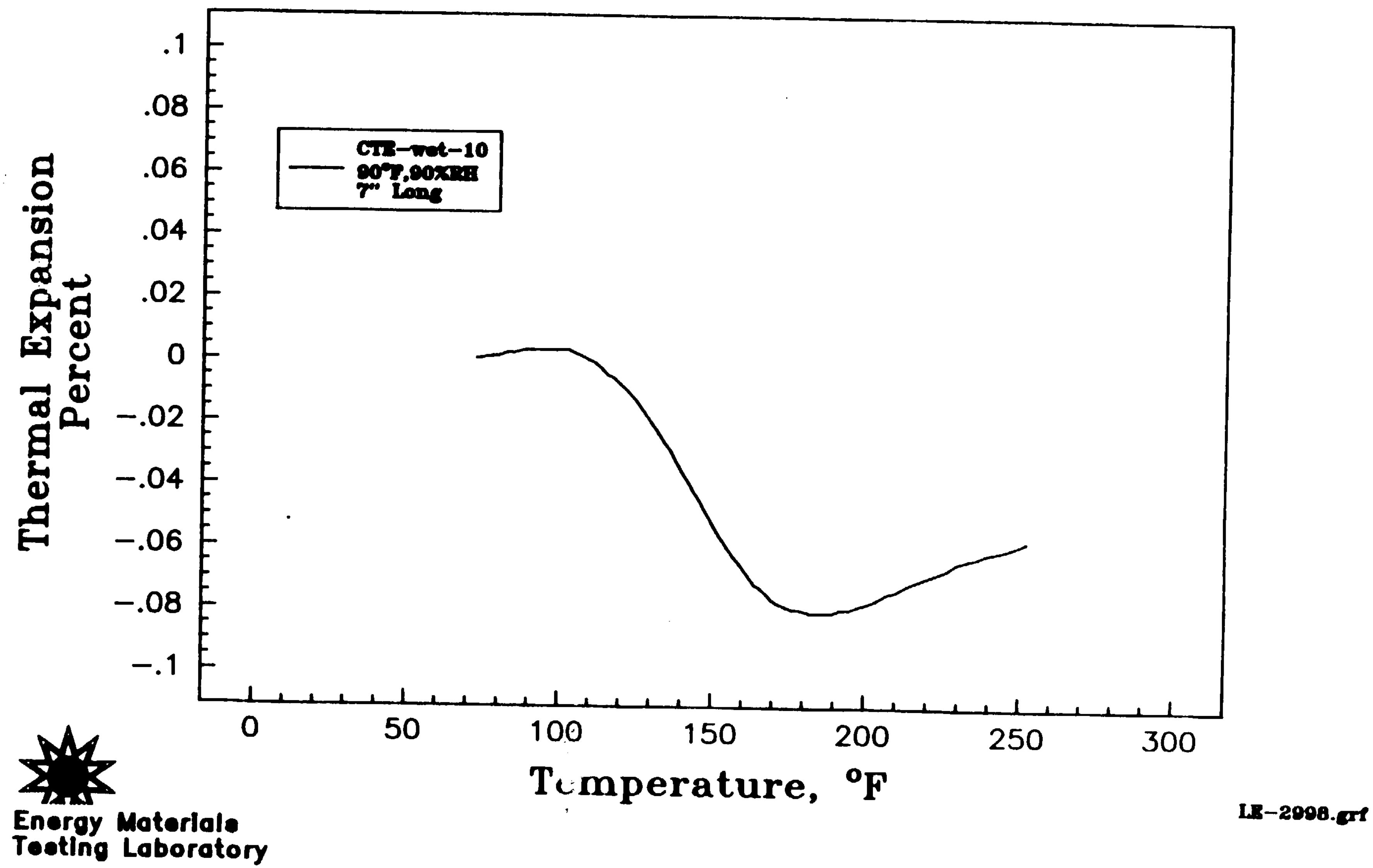
PVA/MB SOLUBLE CORE THERMAL EXPANSION TEST AGED AT 90°F, 90% RH



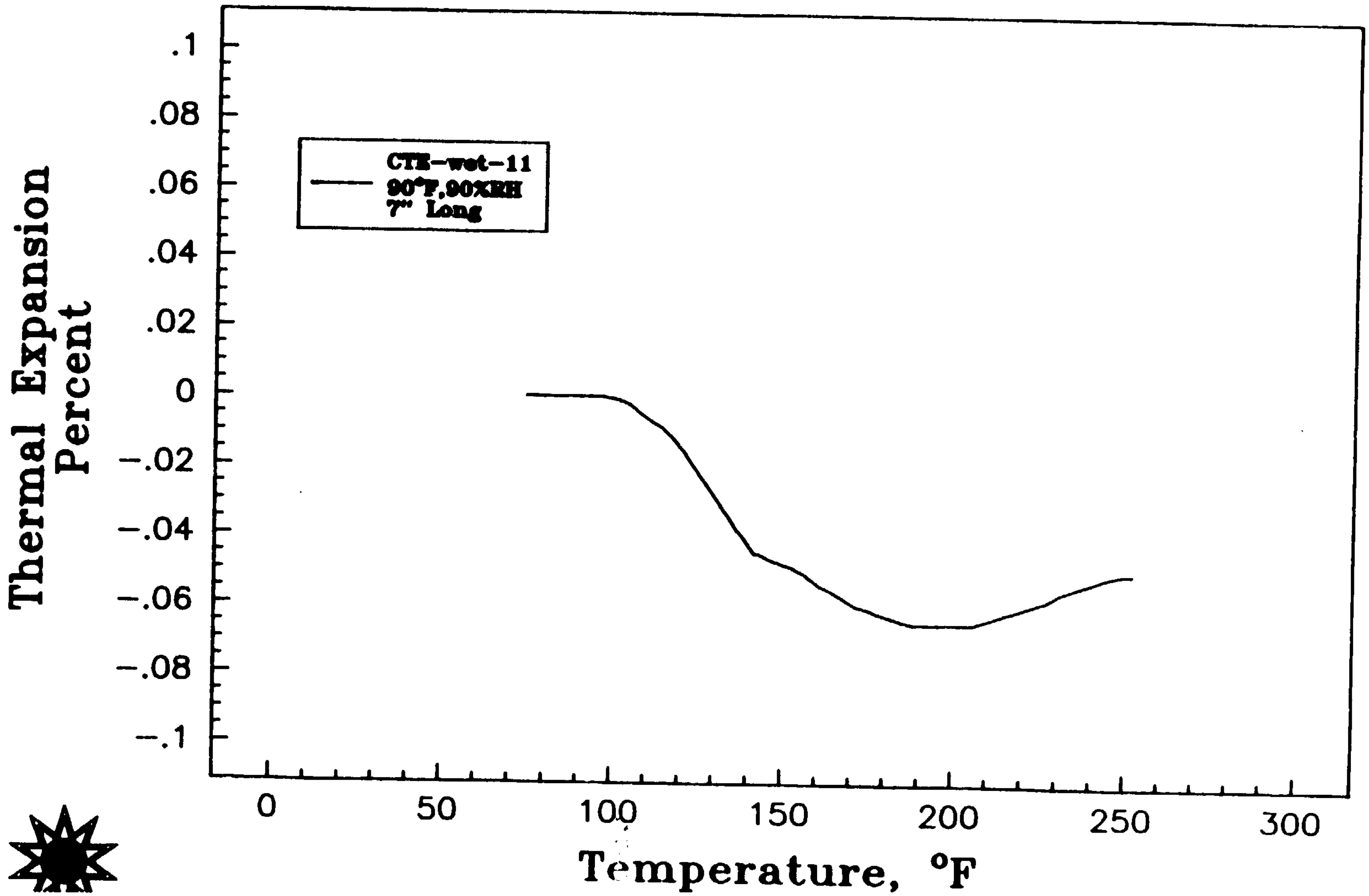
Energy Materials Testing Laboratory

LE−2997.grf

PVA/MB SOLUBLE CORE THERMAL EXPANSION TEST AGED AT 90°F, 90% RH



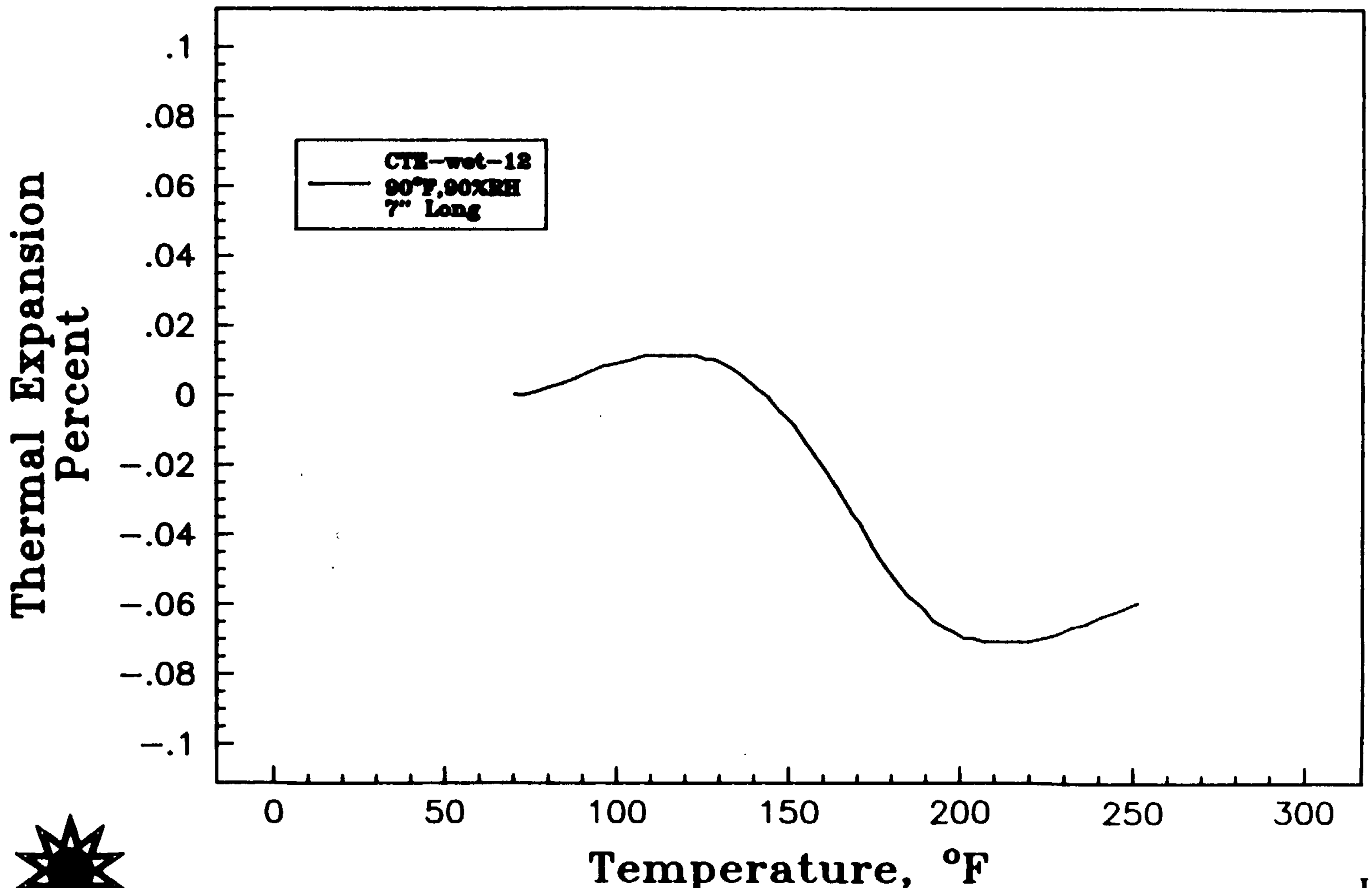
PVA/MB SOLUBLE CORE THERMAL EXPANSION TEST AGED AT 90°F, 90% RH



Energy Materials Testing Laboratory

LE-2999.grf

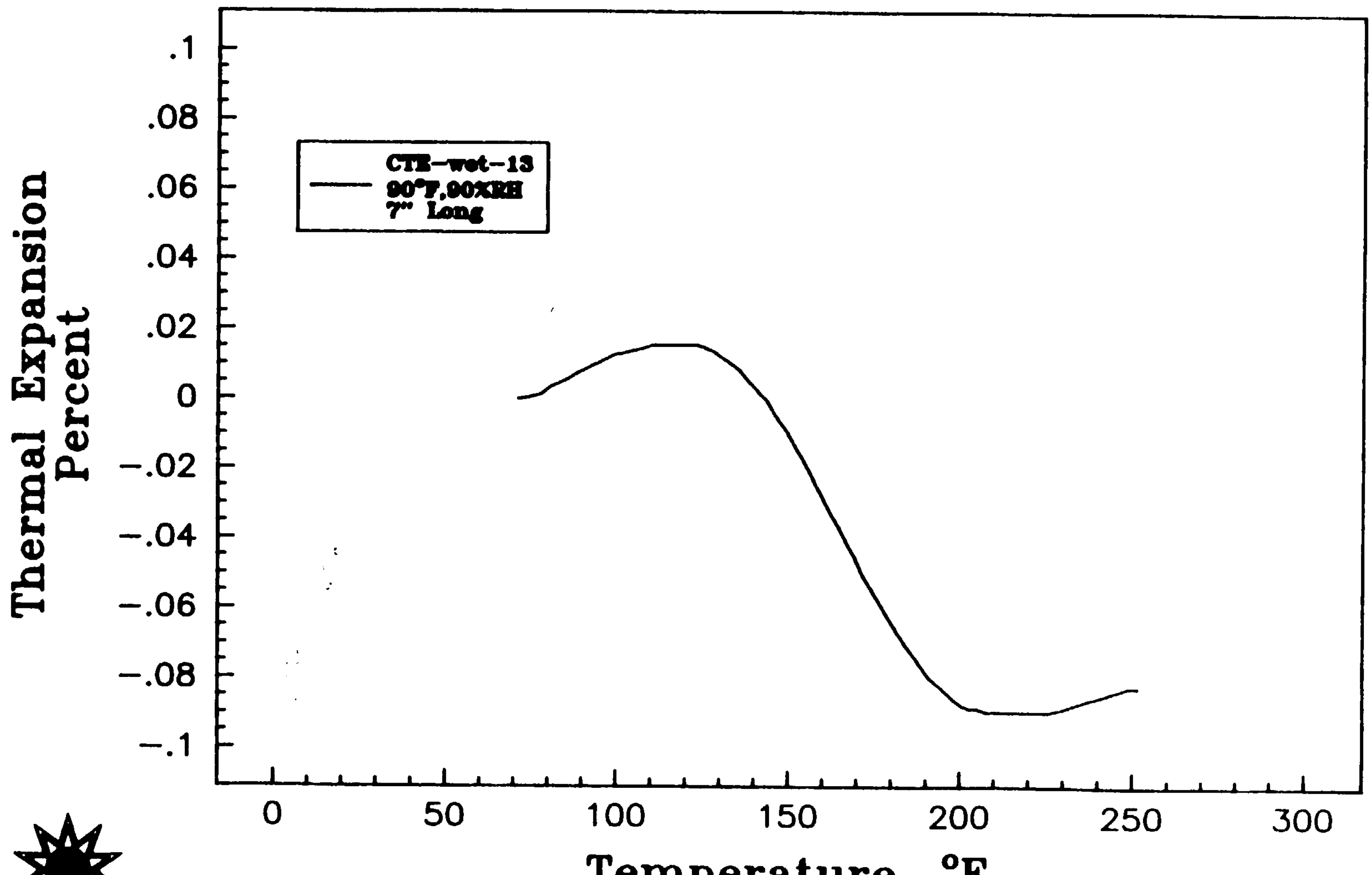
PVA/MB SOLUBLE CORE THERMAL EXPANSION TEST
AGED AT 90°F, 90% RH



Energy Materials Testing Laboratory

LE-3000.grf

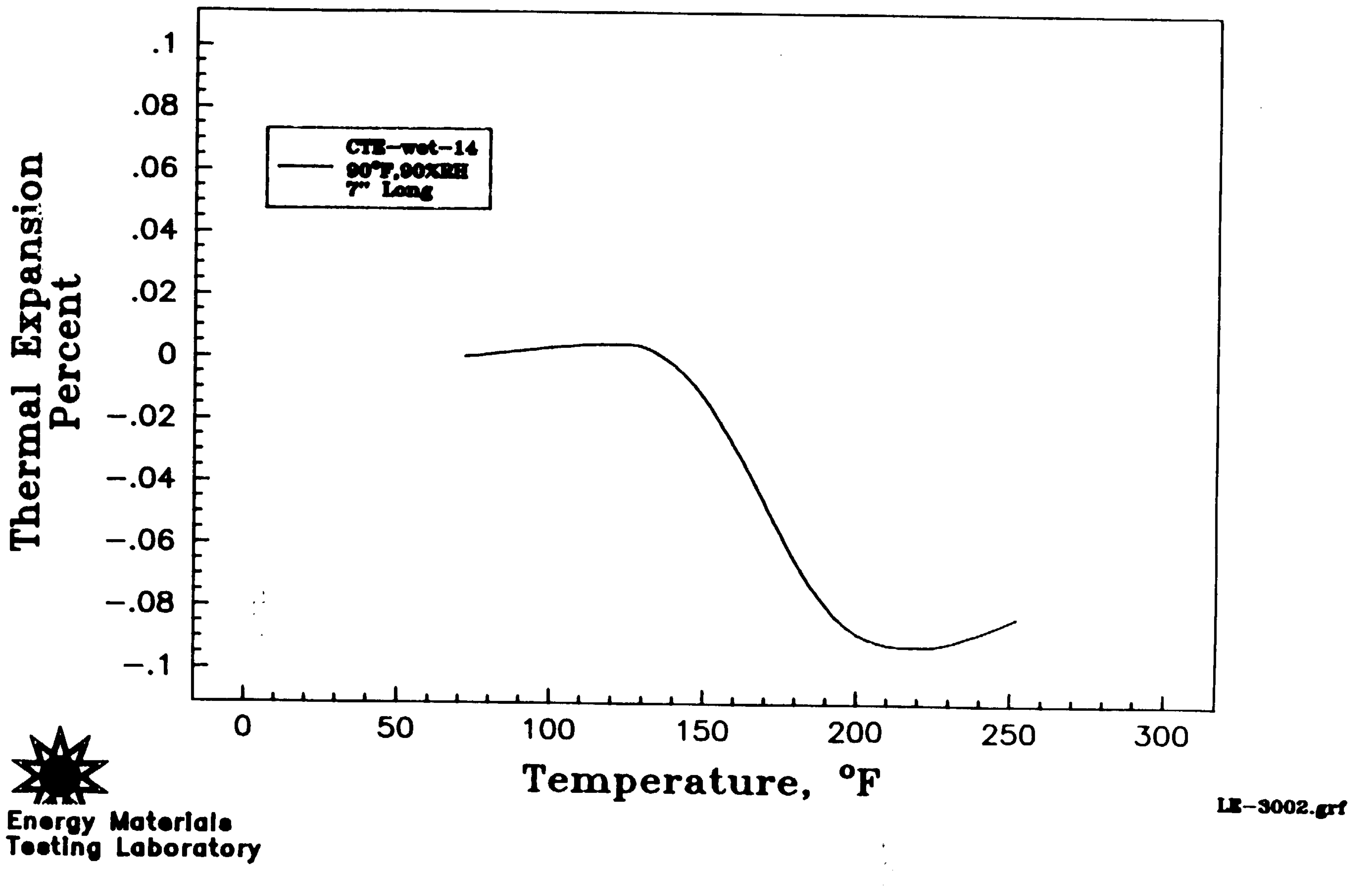
PVA/MB SOLUBLE CORE THERMAL EXPANSION TEST
AGED AT 90°F, 90% RH



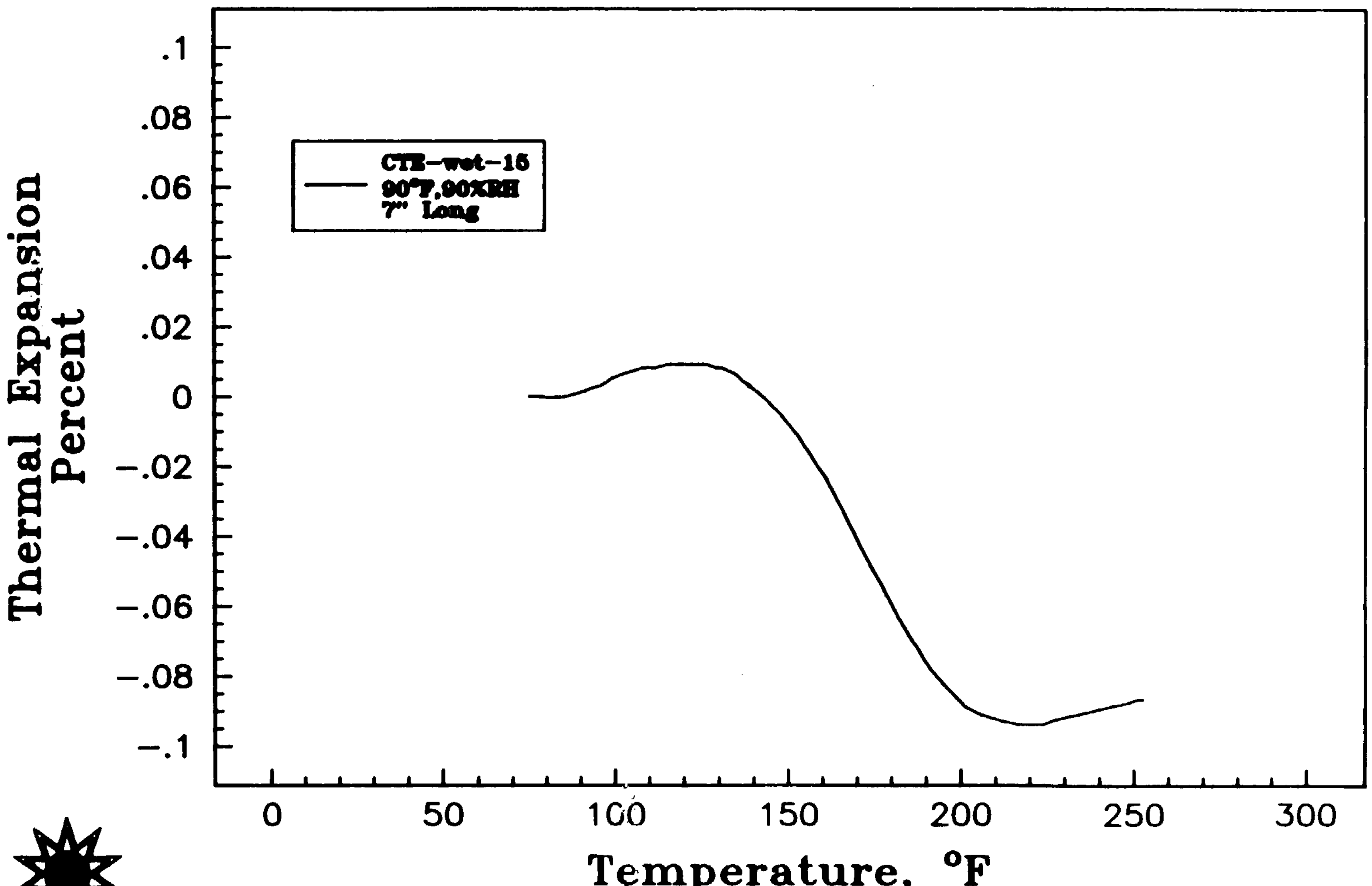
Energy Materials Testing Laboratory

LE−3001.grf

PVA/MB SOLUBLE CORE THERMAL EXPANSION TEST AGED AT 90°F, 90% RH



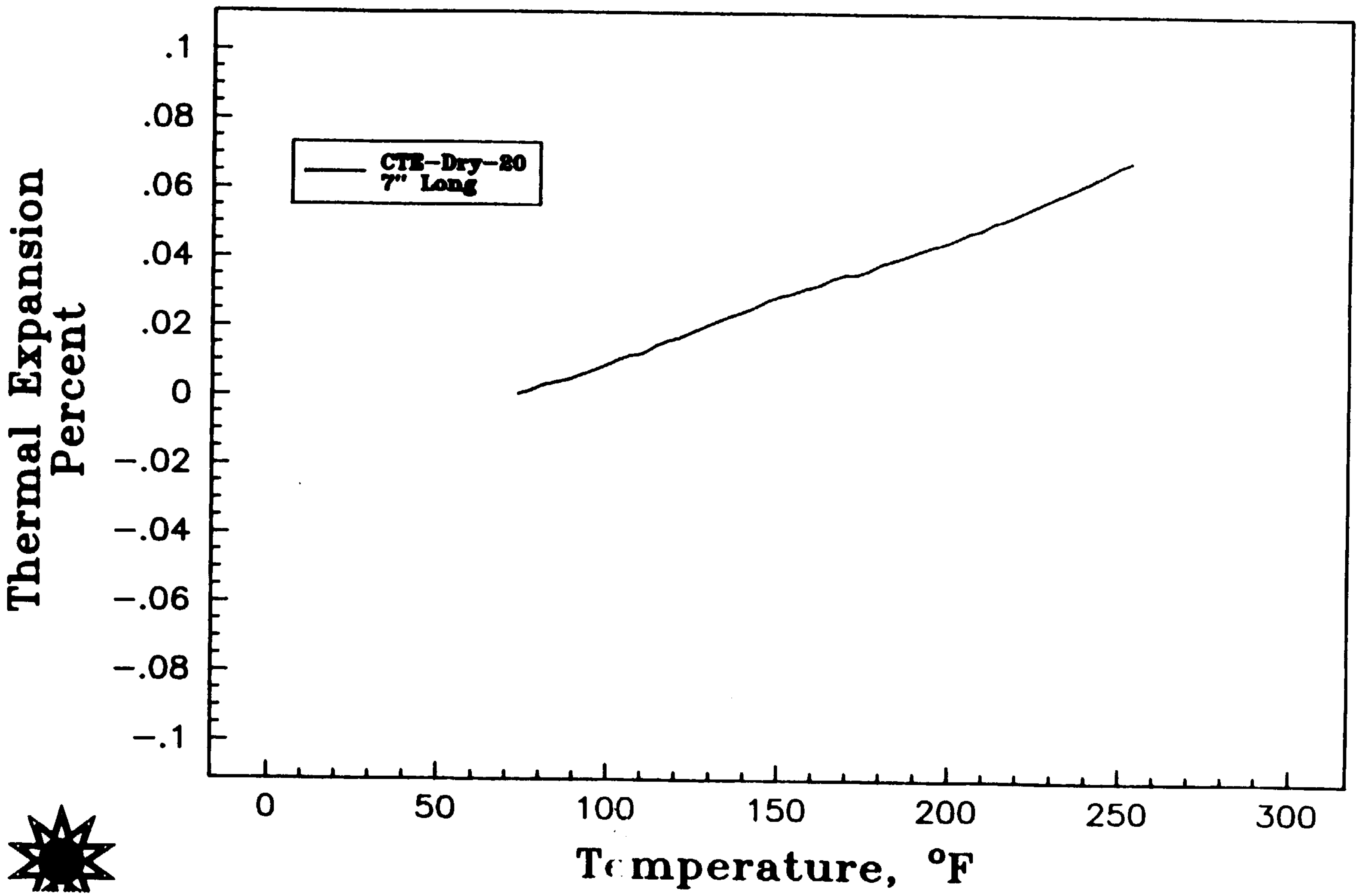
PVA/MB SOLUBLE CORE THERMAL EXPANSION TEST AGED AT 90°F, 90% RH



Energy Materials Testing Laboratory

LE−3003.grf

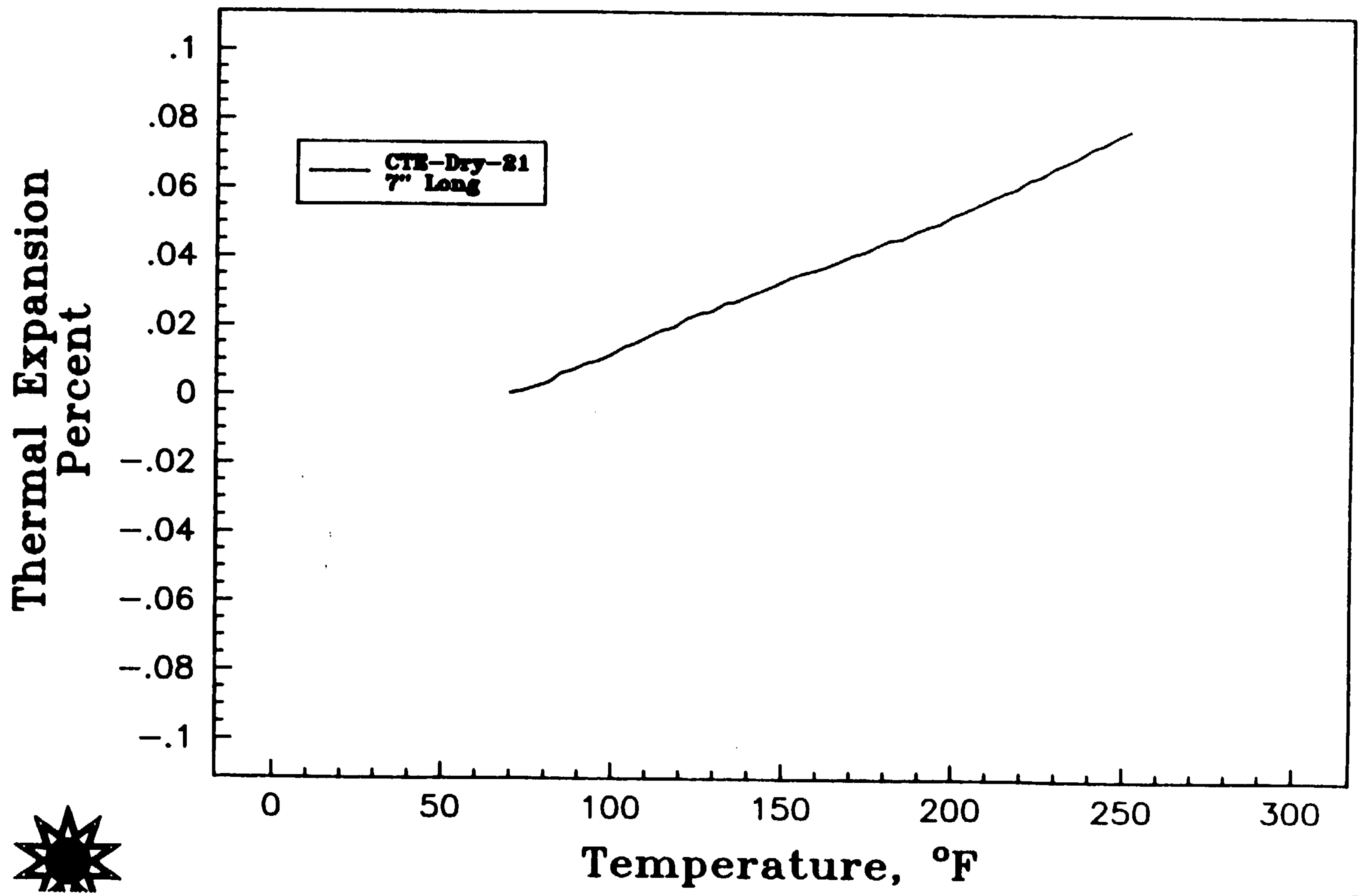
PVA/MB SOLUBLE CORE THERMAL EXPANSION TEST
AGED AT 90°F, 90% RH; THEN DRIED AT 180°F



Energy Materials
Testing Laboratory

LE-3008.grf

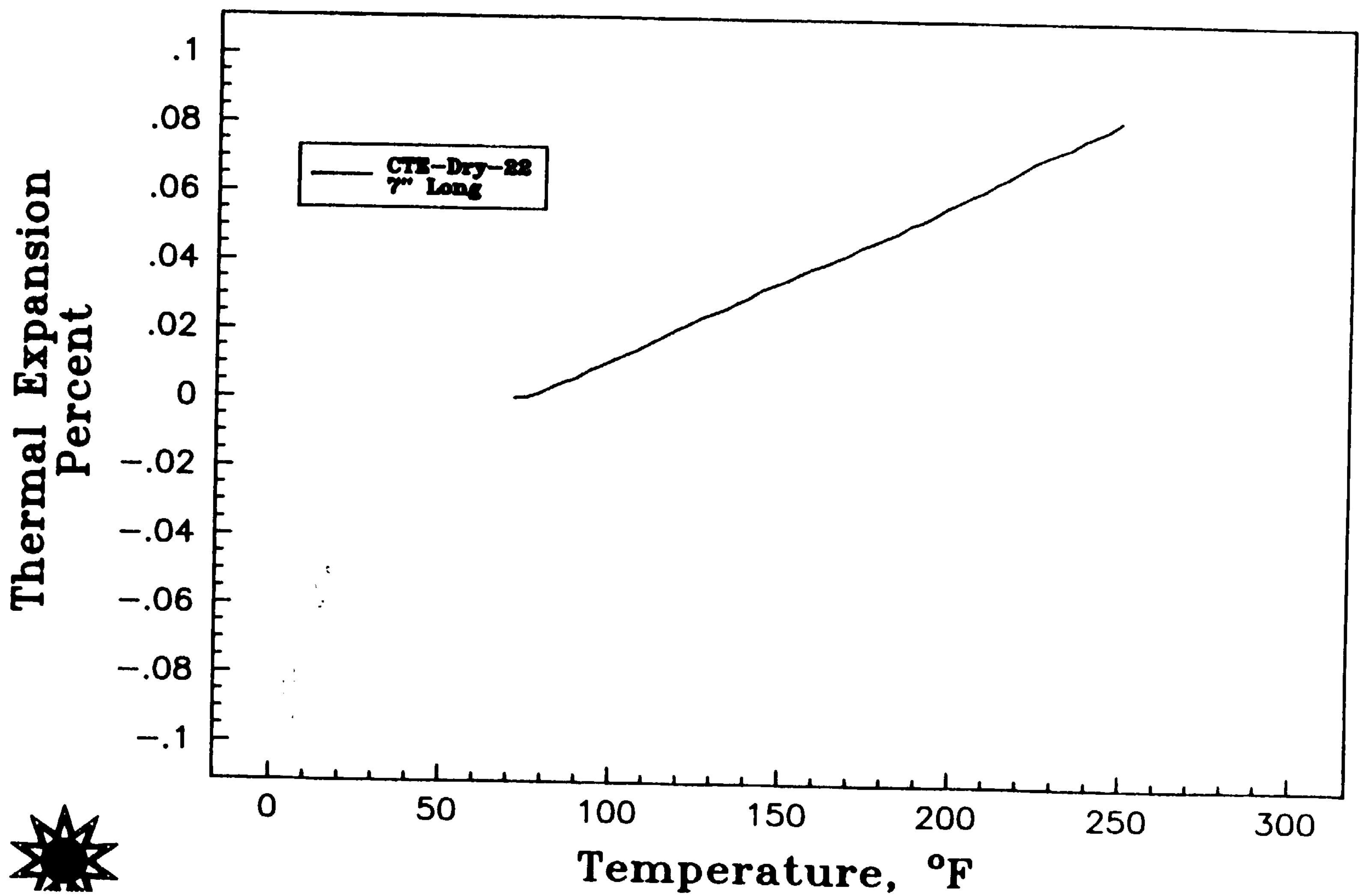
PVA/MB SOLUBLE CORE THERMAL EXPANSION TEST AGED AT 90°F, 90% RH; THEN DRIED AT 180°F



Energy Materials Testing Laboratory

LE-3009.grf

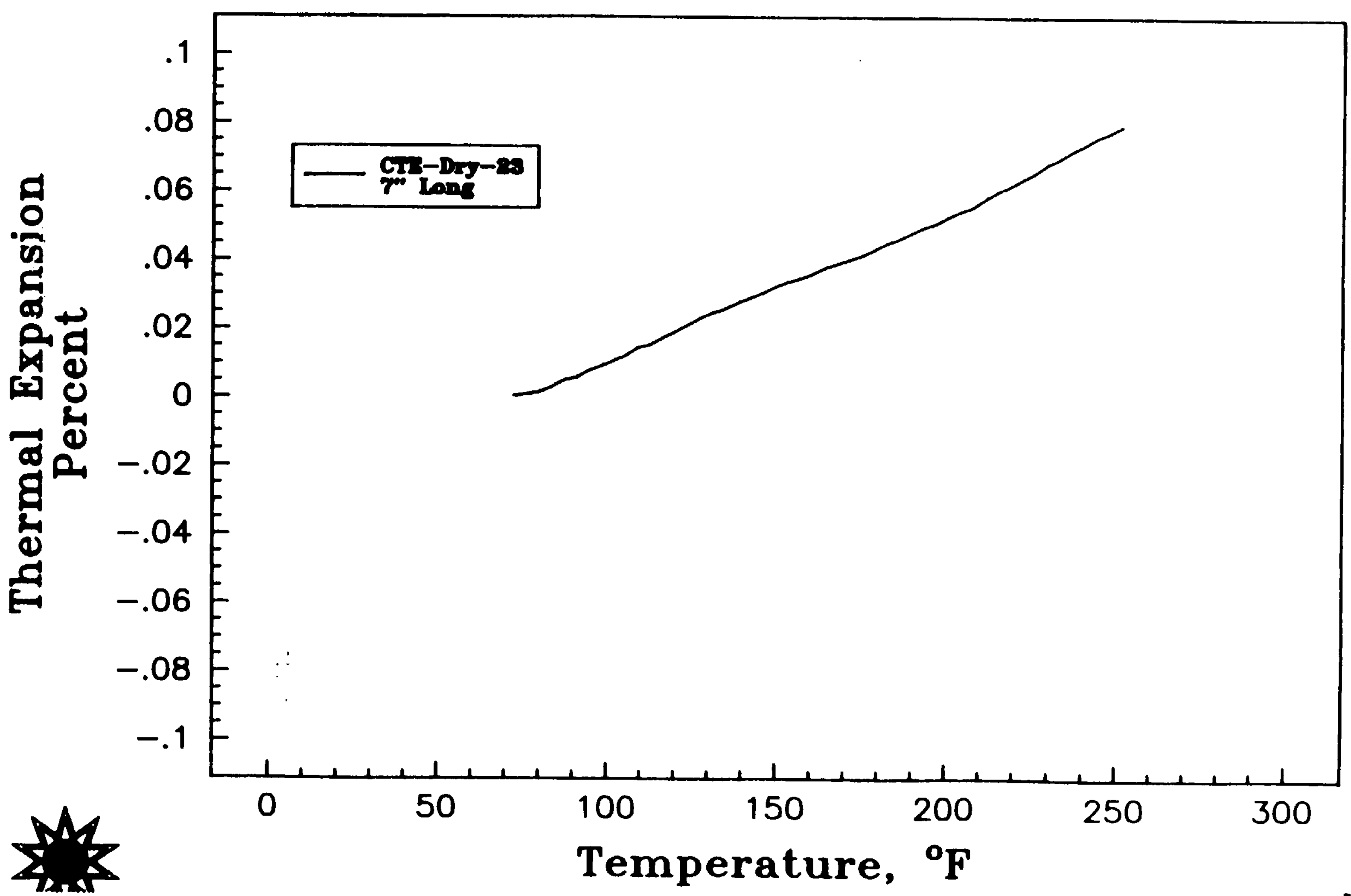
PVA/MB SOLUBLE CORE THERMAL EXPANSION TEST
AGED AT 90°F, 90% RH; THEN DRIED AT 180°F



Energy Materials
Testing Laboratory

LE–3010.grf

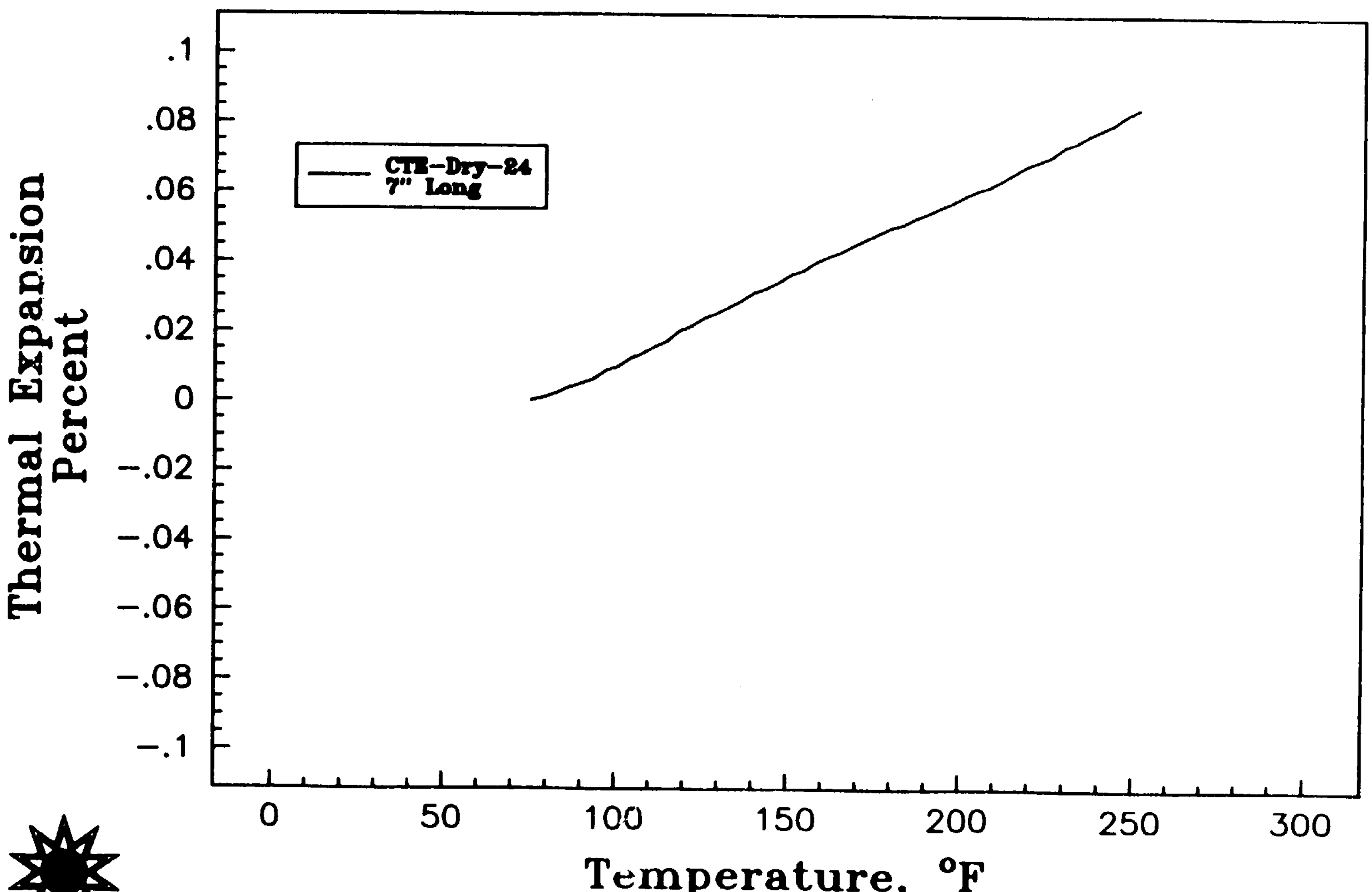
PVA/MB SOLUBLE CORE THERMAL EXPANSION TEST AGED AT 90°F, 90% RH; THEN DRIED AT 180°F



Energy Materials Testing Laboratory

LE-3011.grf

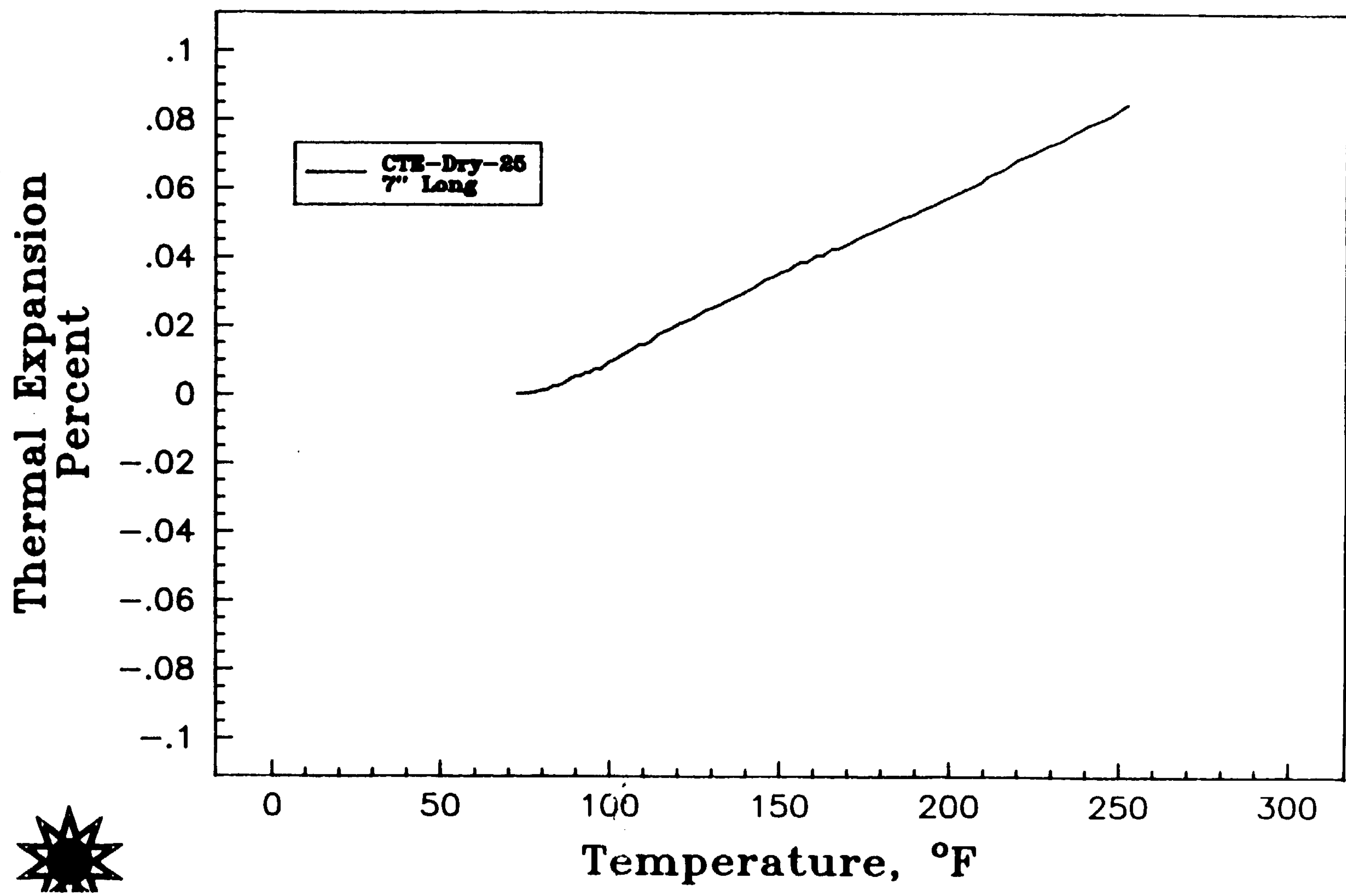
PVA/MB SOLUBLE CORE THERMAL EXPANSION TEST AGED AT 90°F, 90% RH; THEN DRIED AT 180°F



Energy Materials Testing Laboratory

LE-3012.grf

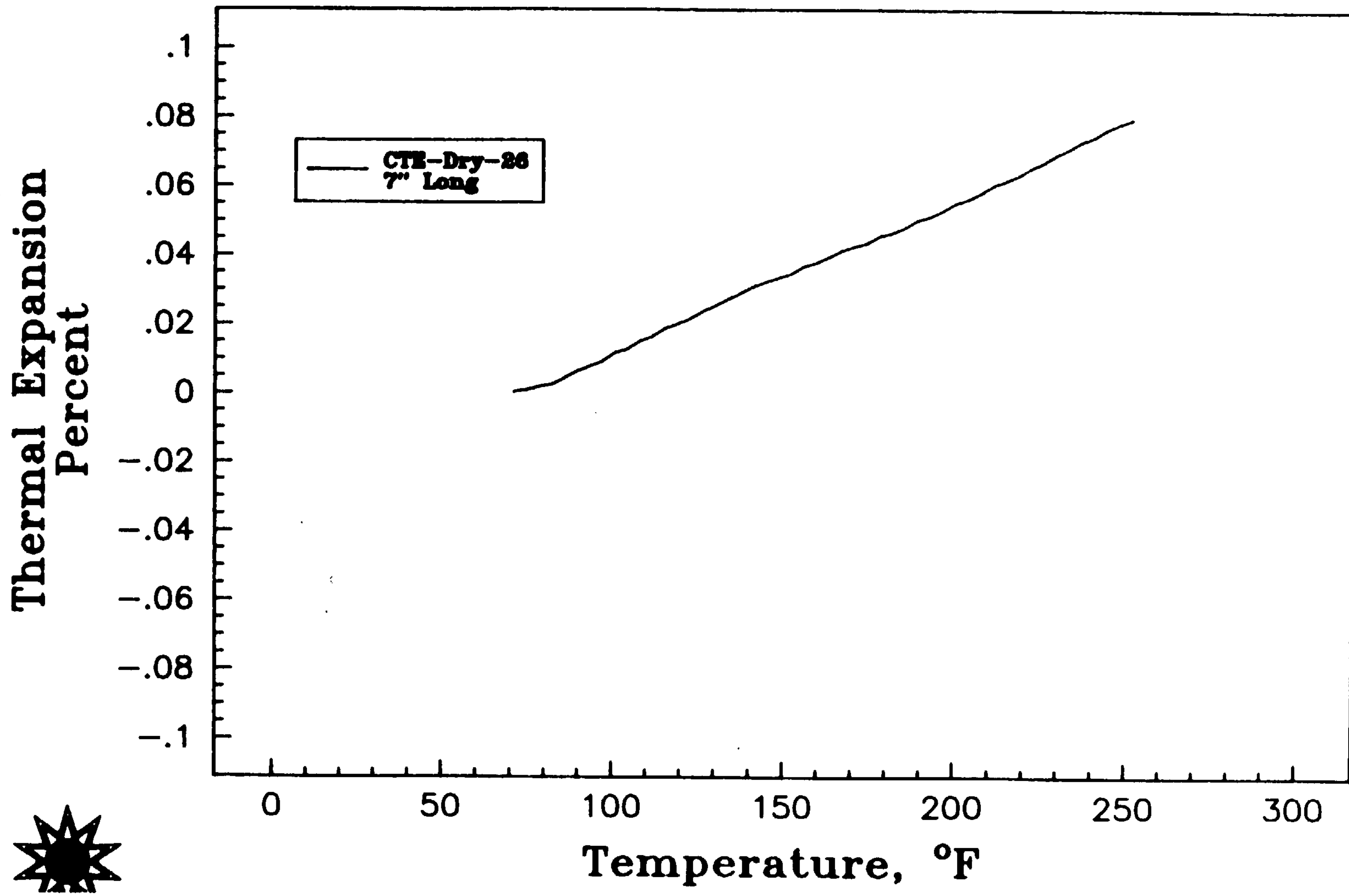
PVA/MB SOLUBLE CORE THERMAL EXPANSION TEST
AGED AT 90°F, 90% RH; THEN DRIED AT 180°F



Energy Materials
Testing Laboratory

LE-3013.grf

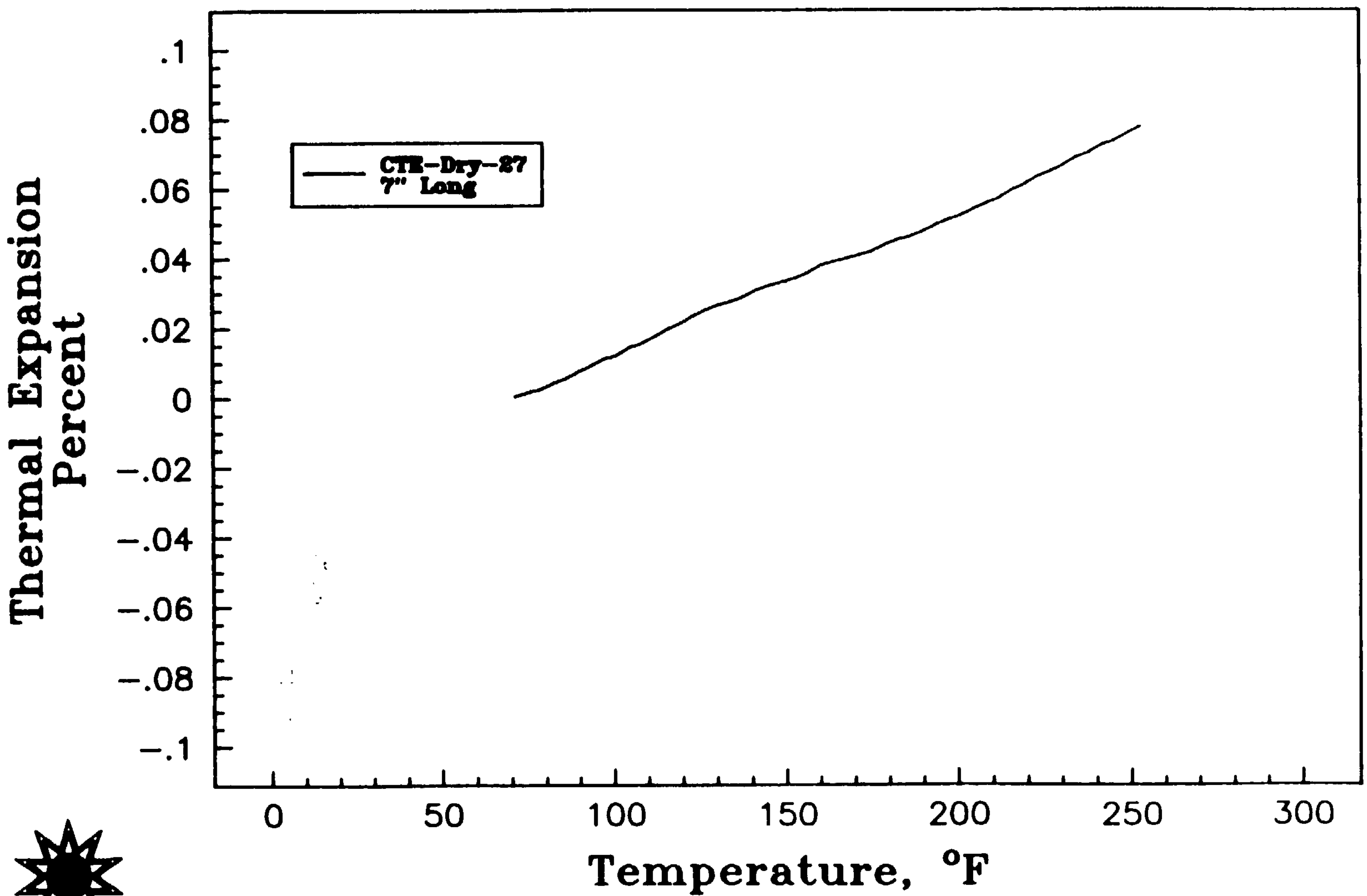
PVA/MB SOLUBLE CORE THERMAL EXPANSION TEST
AGED AT 90°F, 90% RH; THEN DRIED AT 180°F



Energy Materials
Testing Laboratory

LE-3014.grf

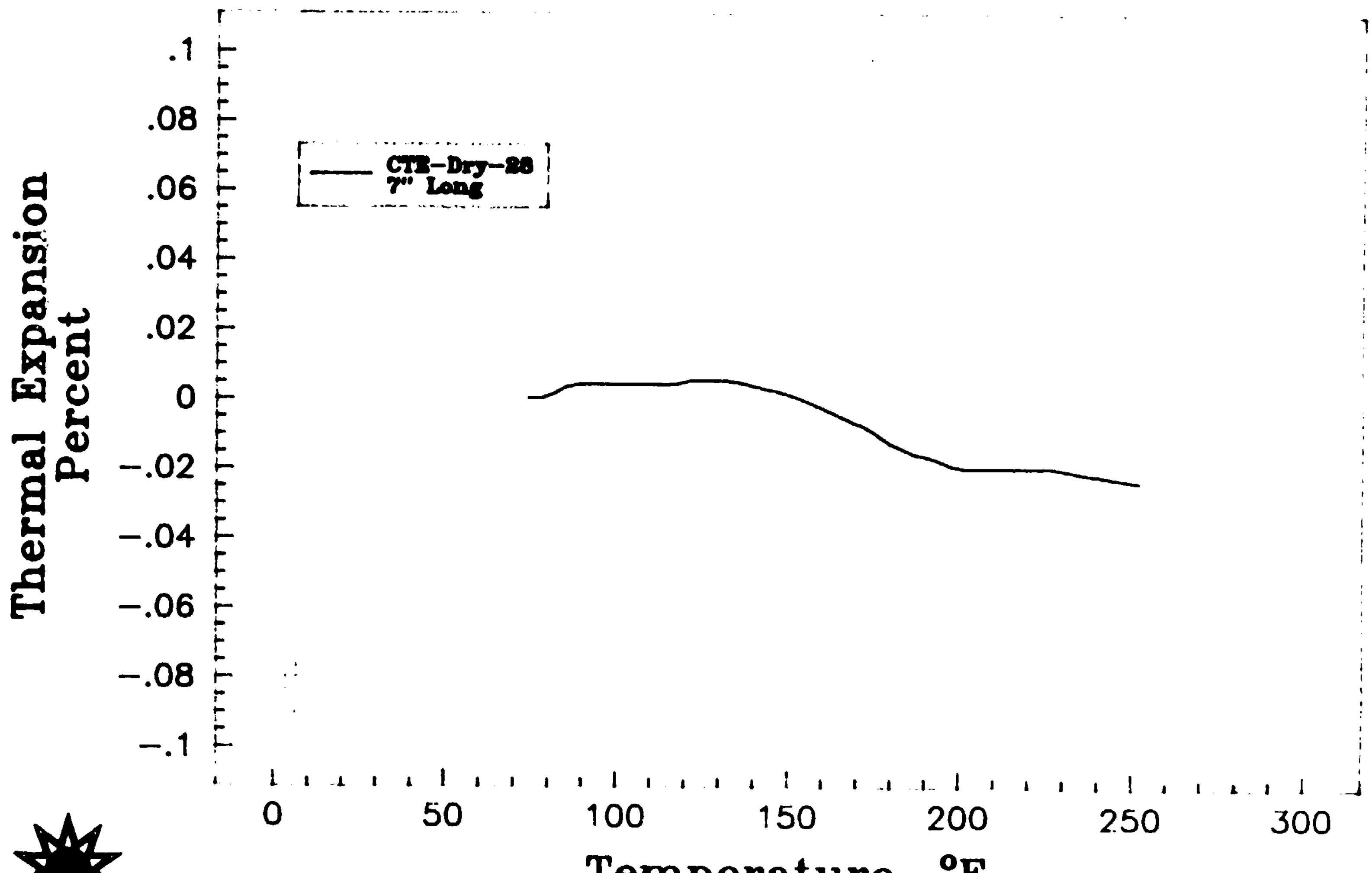
PVA/MB SOLUBLE CORE THERMAL EXPANSION TEST AGED AT 90°F, 90% RH; THEN DRIED AT 180°F



Energy Materials Testing Laboratory

LE-3015.grf

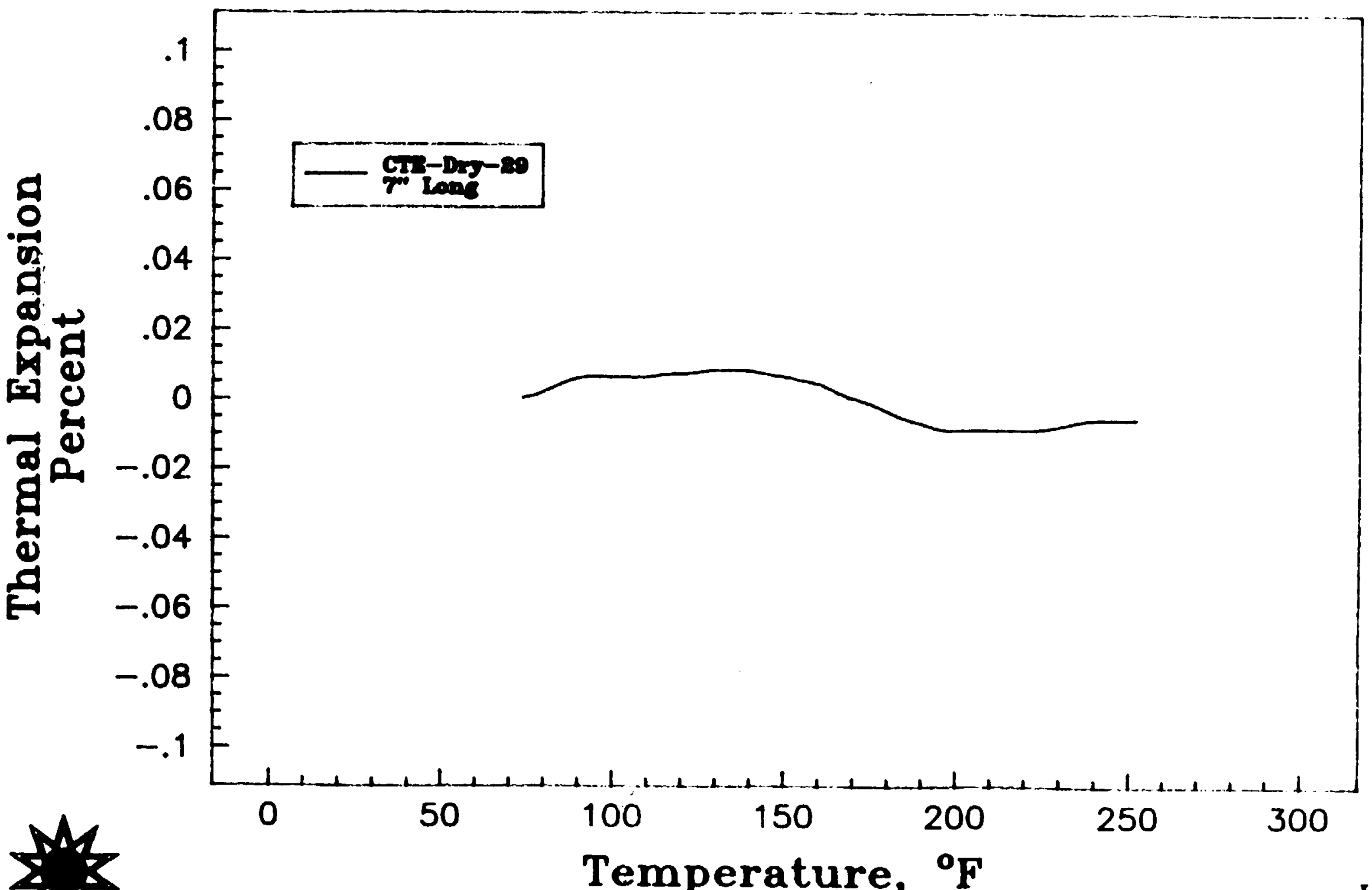
PVA/MB SOLUBLE CORE THERMAL EXPANSION TEST
AGED AT 70°F, 50% RH



Energy Materials Testing Laboratory

LE-3016.grf

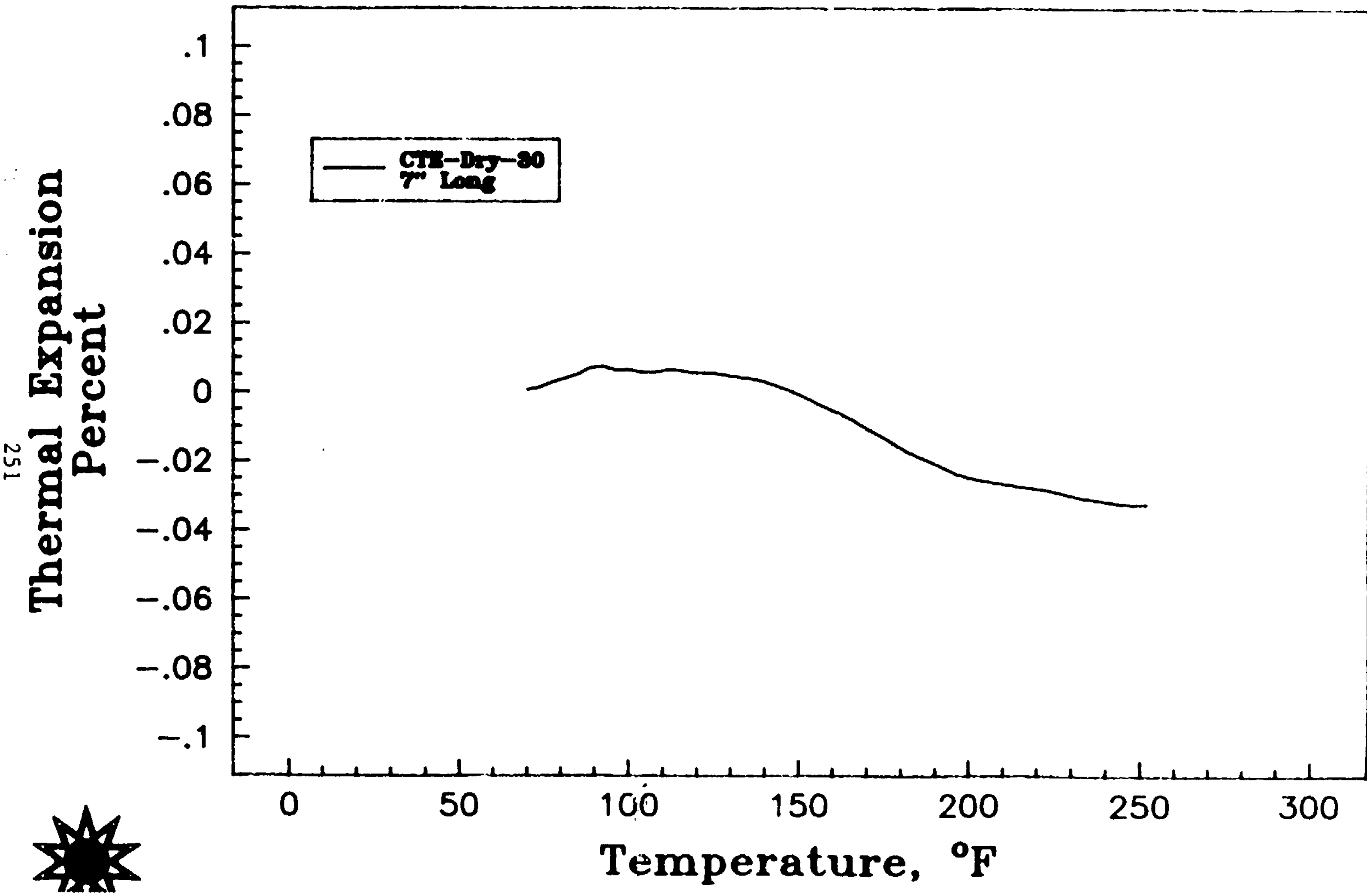
PVA/MB SOLUBLE CORE THERMAL EXPANSION TEST
AGED AT 70°F, 50% RH



Energy Materials
Testing Laboratory

LE-3017.grf

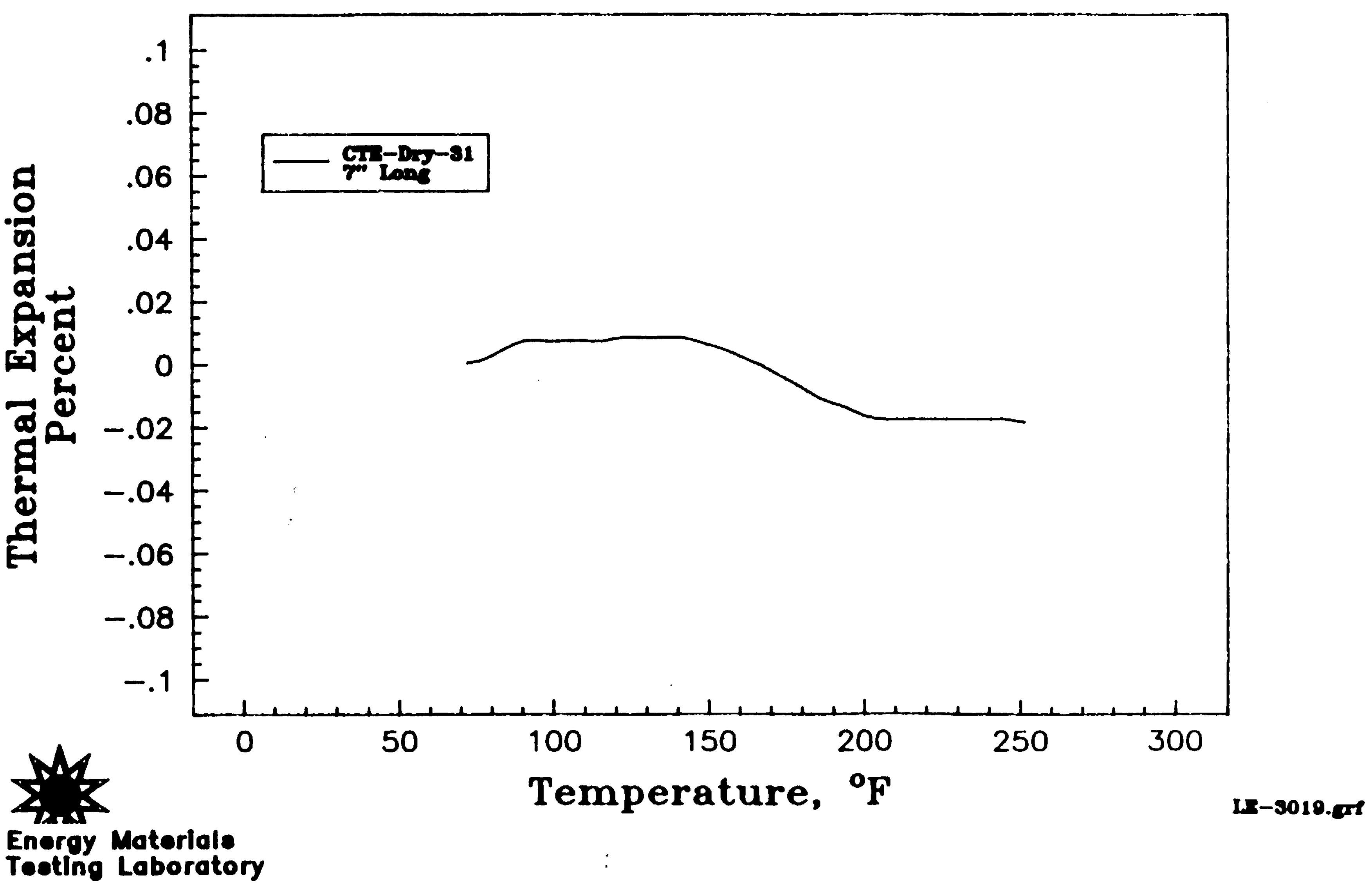
PVA/MB SOLUBLE CORE THERMAL EXPANSION TEST
AGED AT 70°F, 50% RH



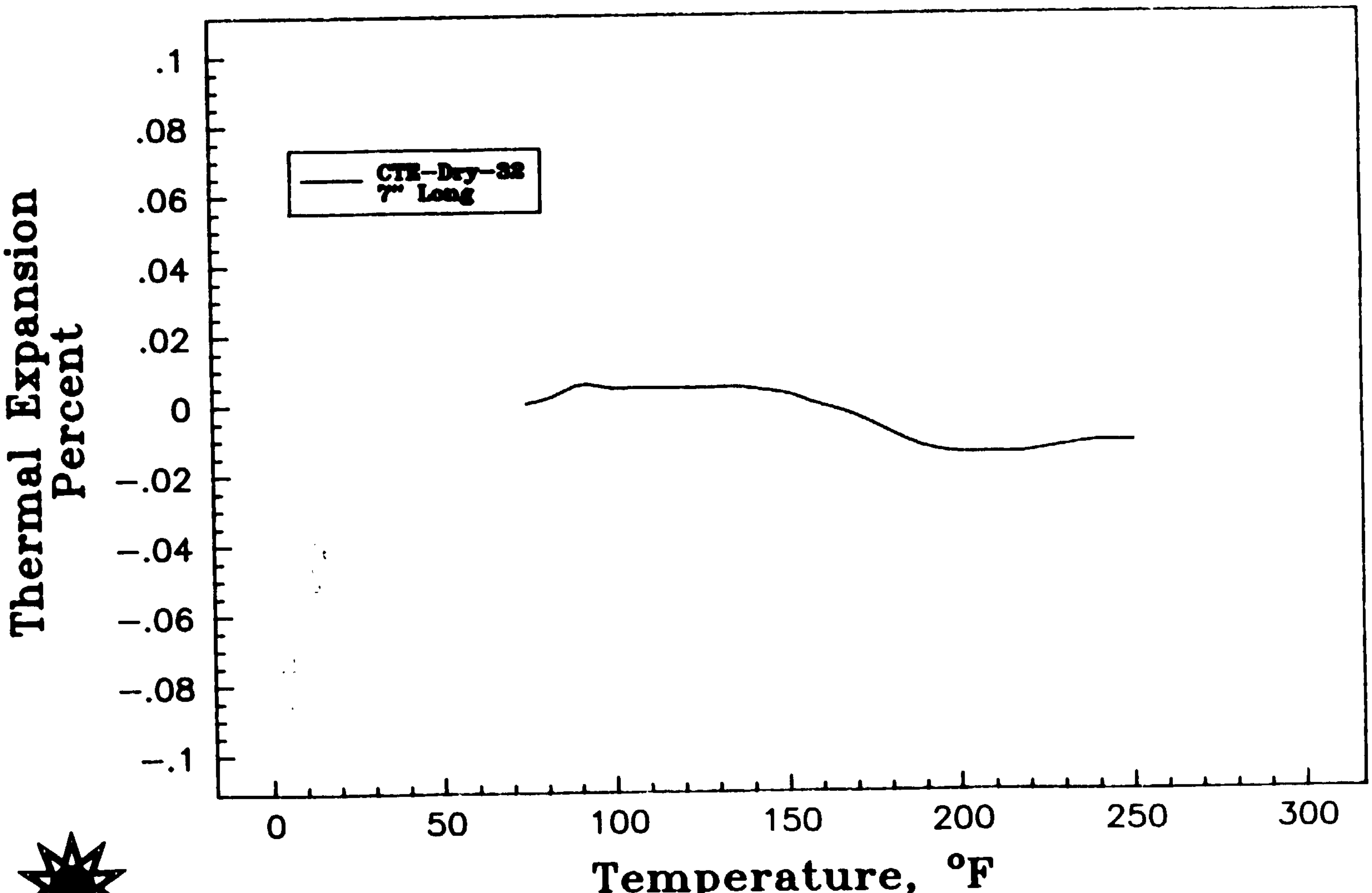
Energy Materials Testing Laboratory

LE-3016.grf

PVA/MB SOLUBLE CORE THERMAL EXPANSION TEST AGED AT 70°F, 50% RH



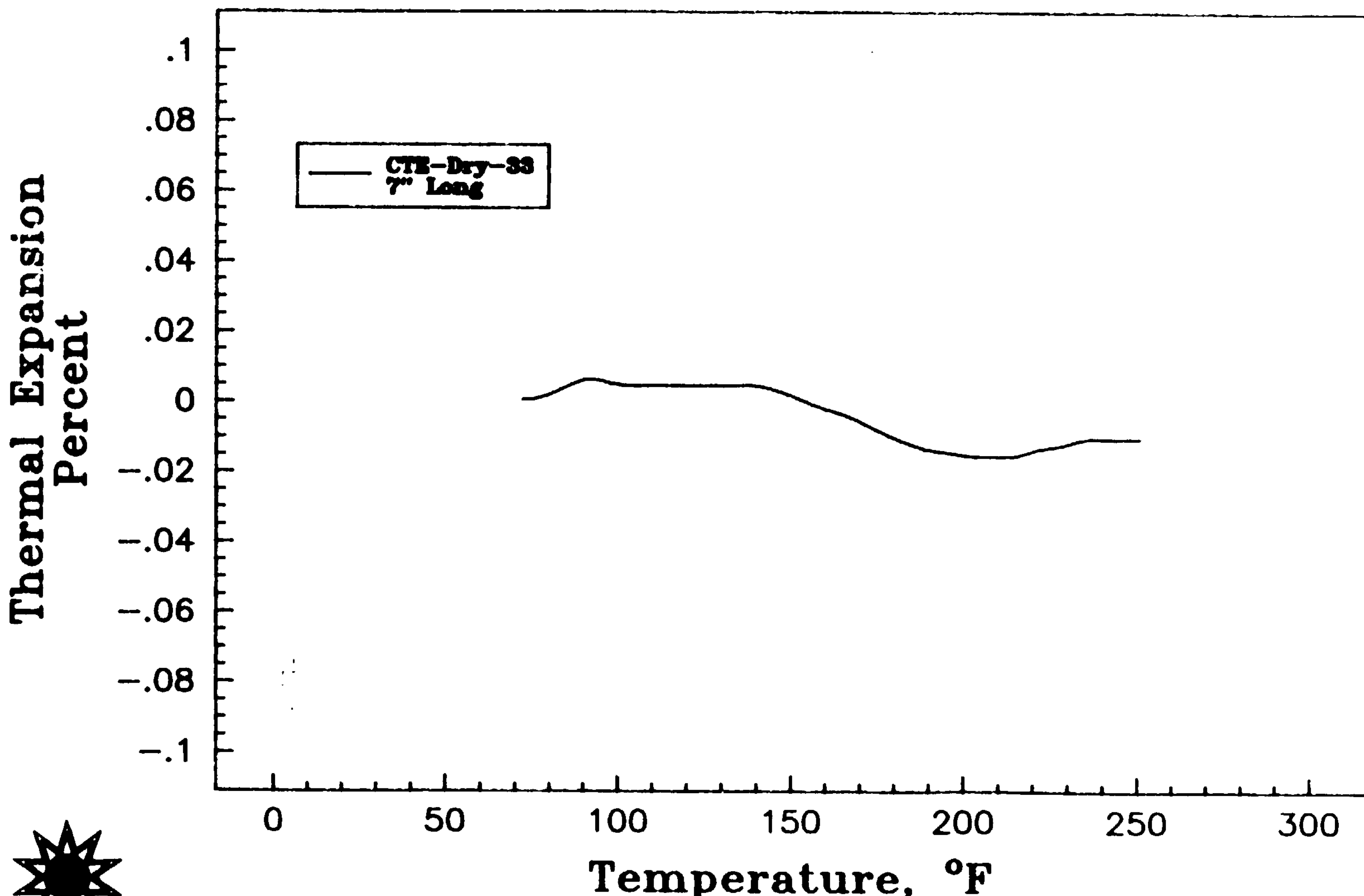
PVA/MB SOLUBLE CORE THERMAL EXPANSION TEST
AGED AT 70°F, 50% RH



Energy Materials Testing Laboratory

LE-3020.grf

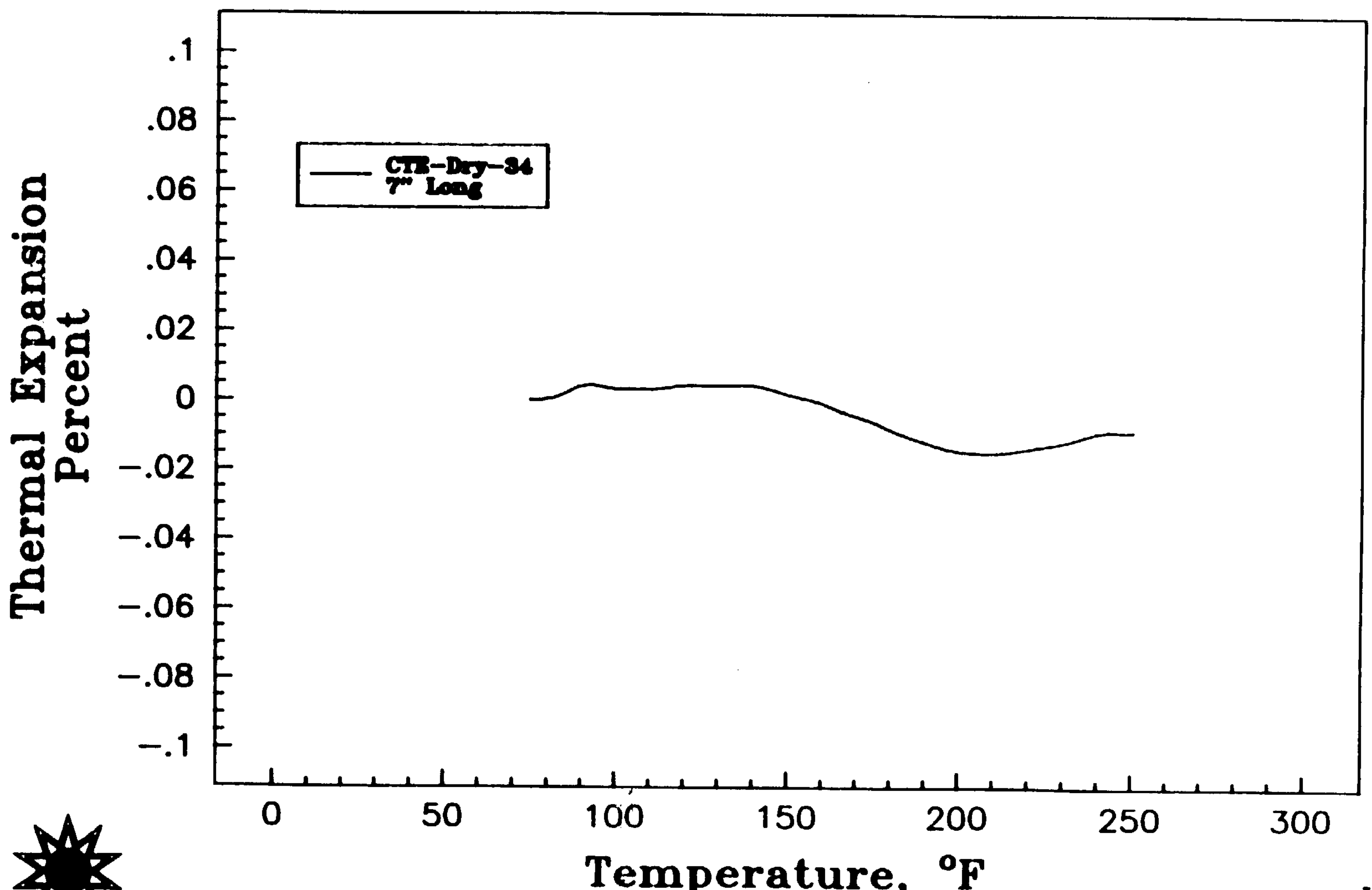
PVA/MB SOLUBLE CORE THERMAL EXPANSION TEST
AGED AT 70°F, 50% RH



Energy Materials
Testing Laboratory

LE-3021.grf

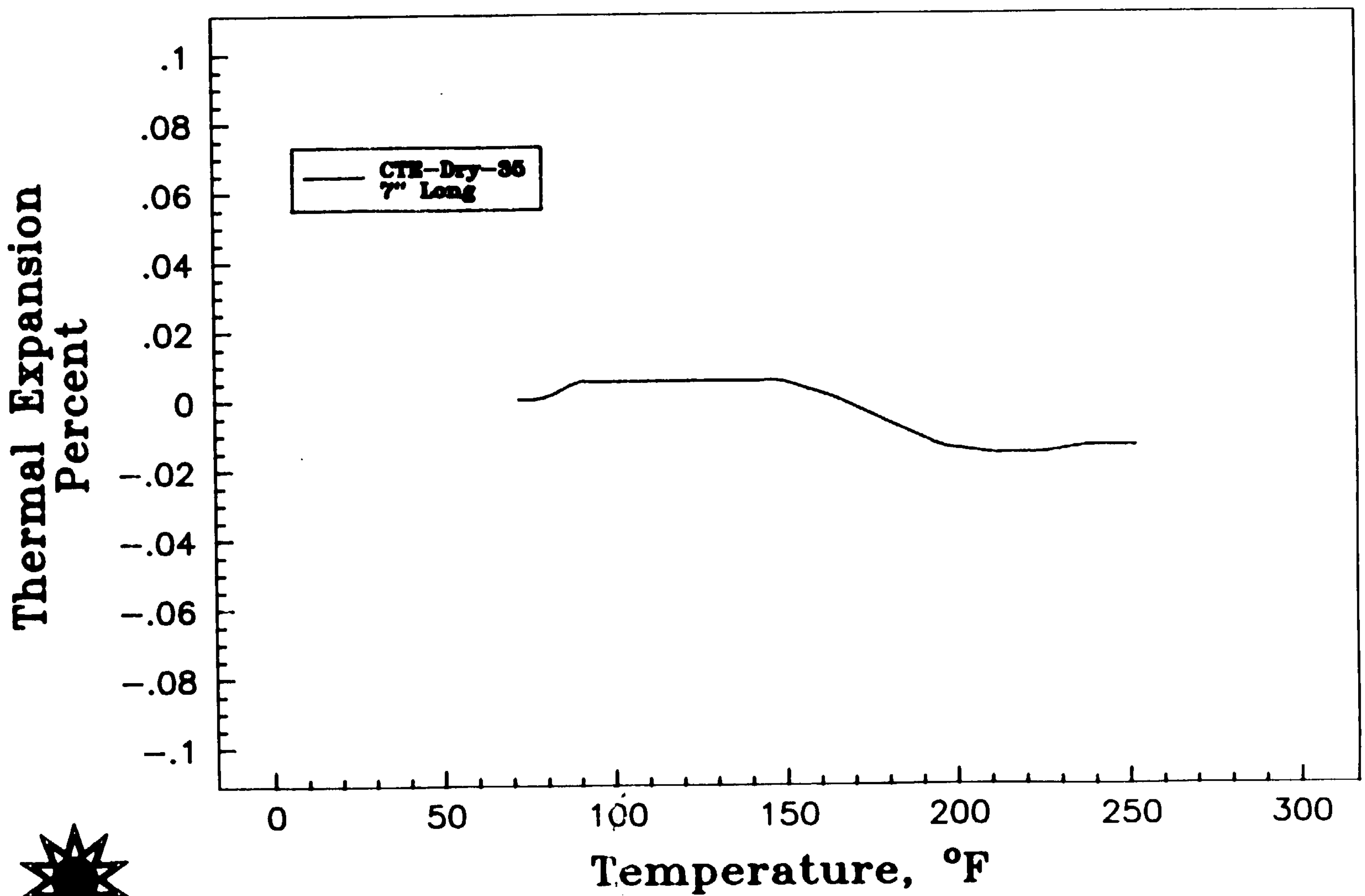
PVA/MB SOLUBLE CORE THERMAL EXPANSION TEST
AGED AT 70°F, 50% RH



Energy Materials Testing Laboratory

LE-3022.grf

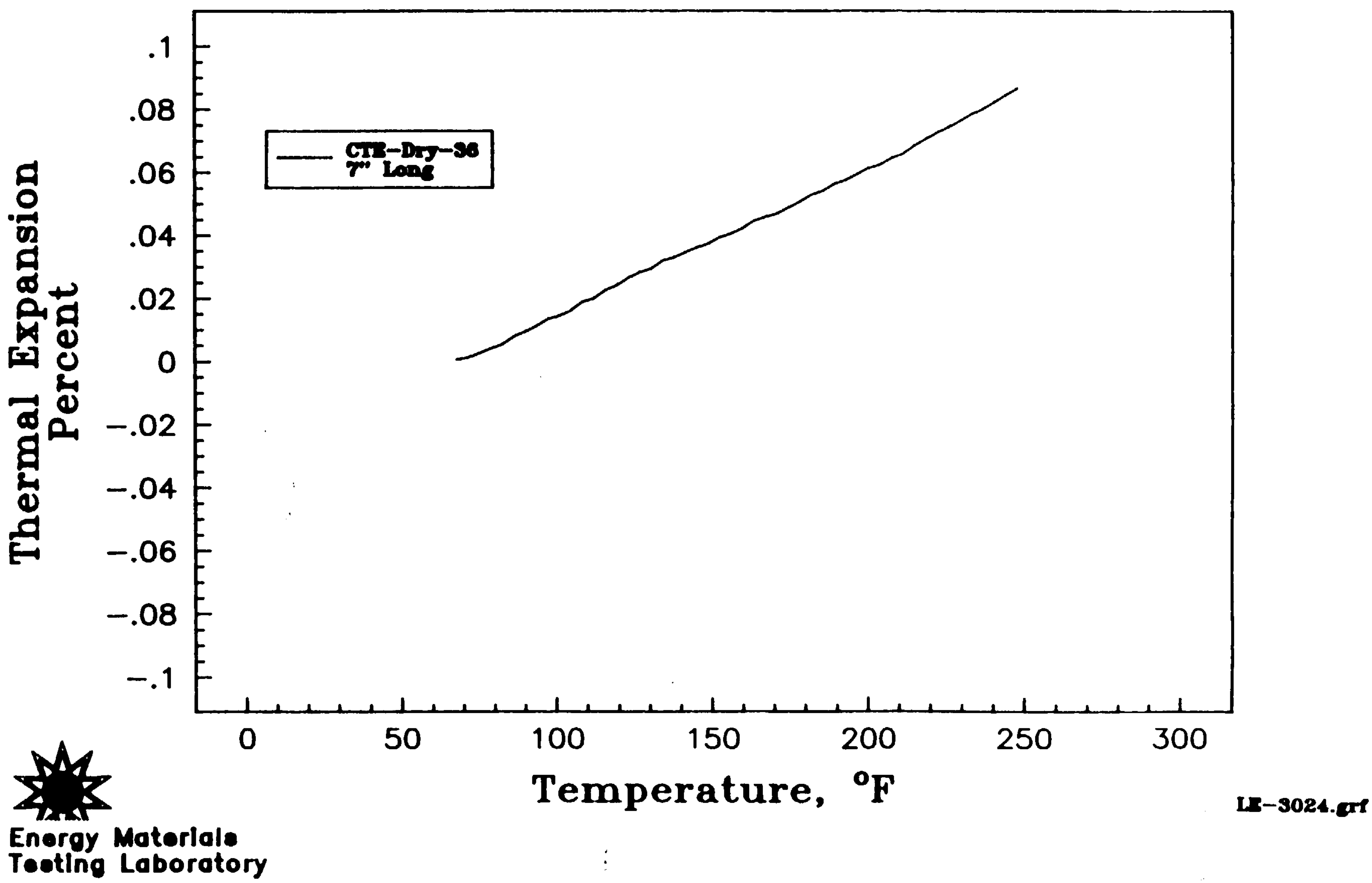
PVA/MB SOLUBLE CORE THERMAL EXPANSION TEST
AGED AT 70°F, 50% RH



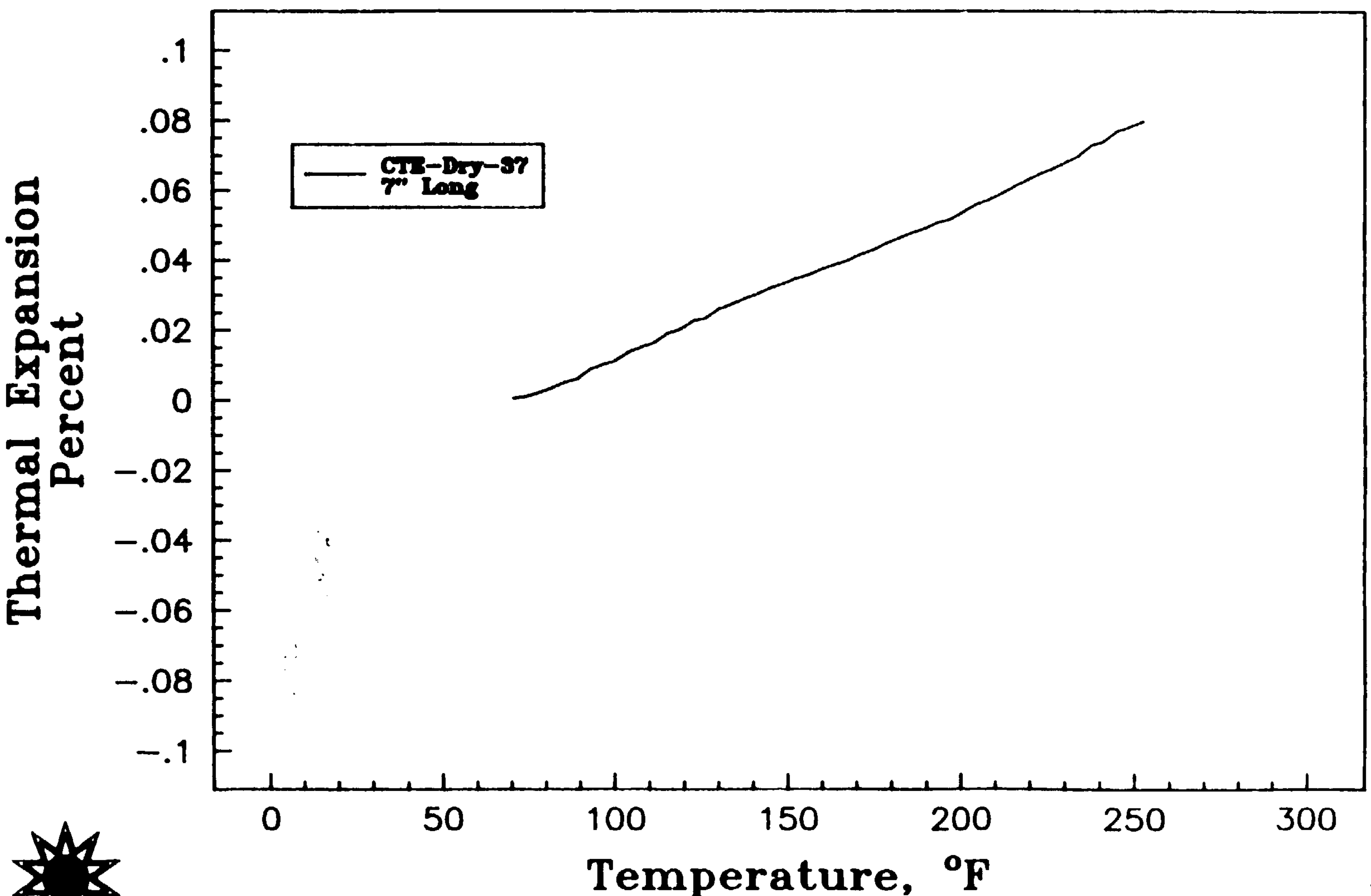
Energy Materials Testing Laboratory

LE-3023.grf

PVA/MB SOLUBLE CORE THERMAL EXPANSION TEST BASELINE SAMPLES; NO HIGH HUMIDITY AGING



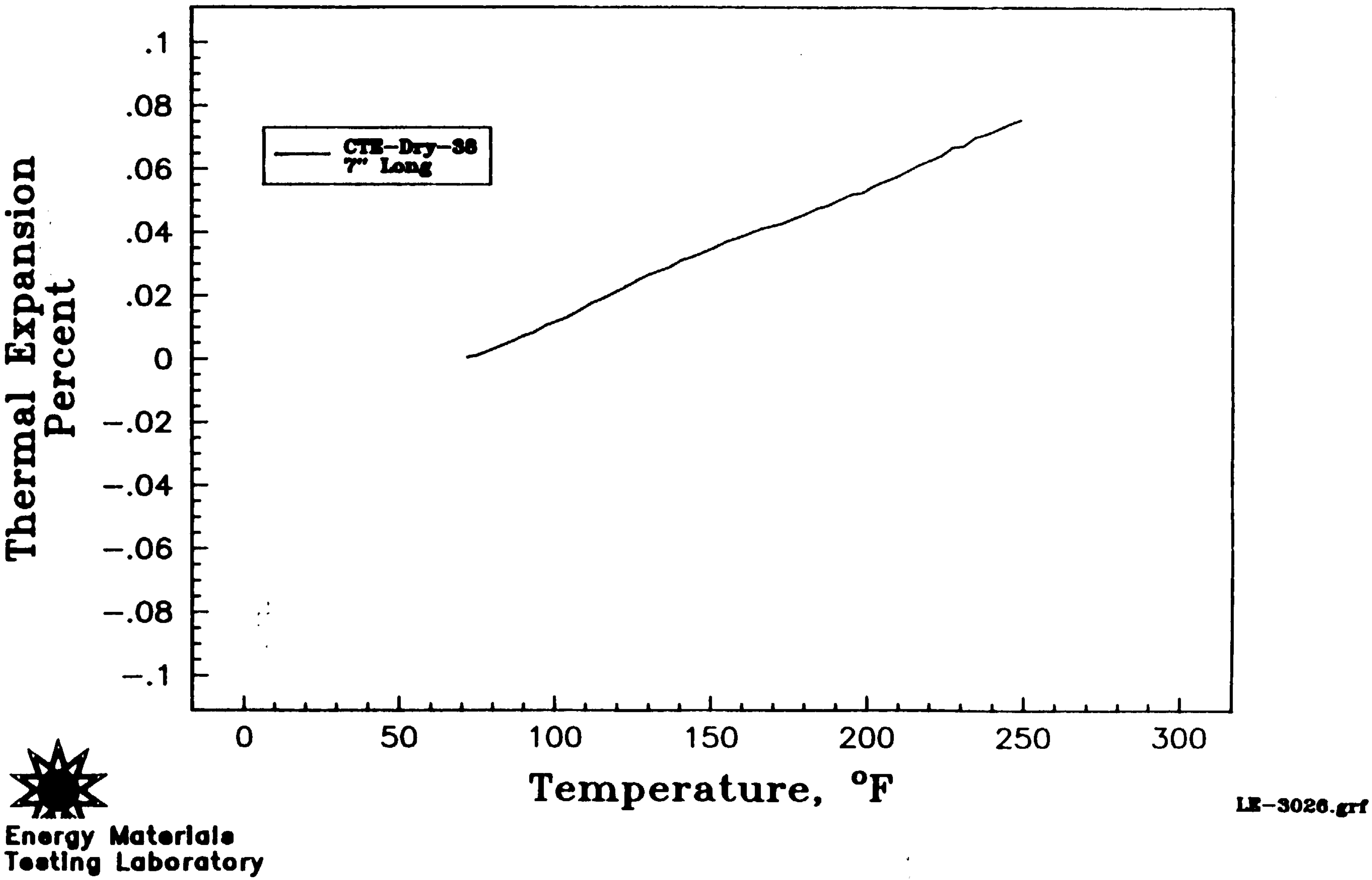
PVA/MB SOLUBLE CORE THERMAL EXPANSION TEST
BASELINE SAMPLES; NO HIGH HUMIDITY AGING



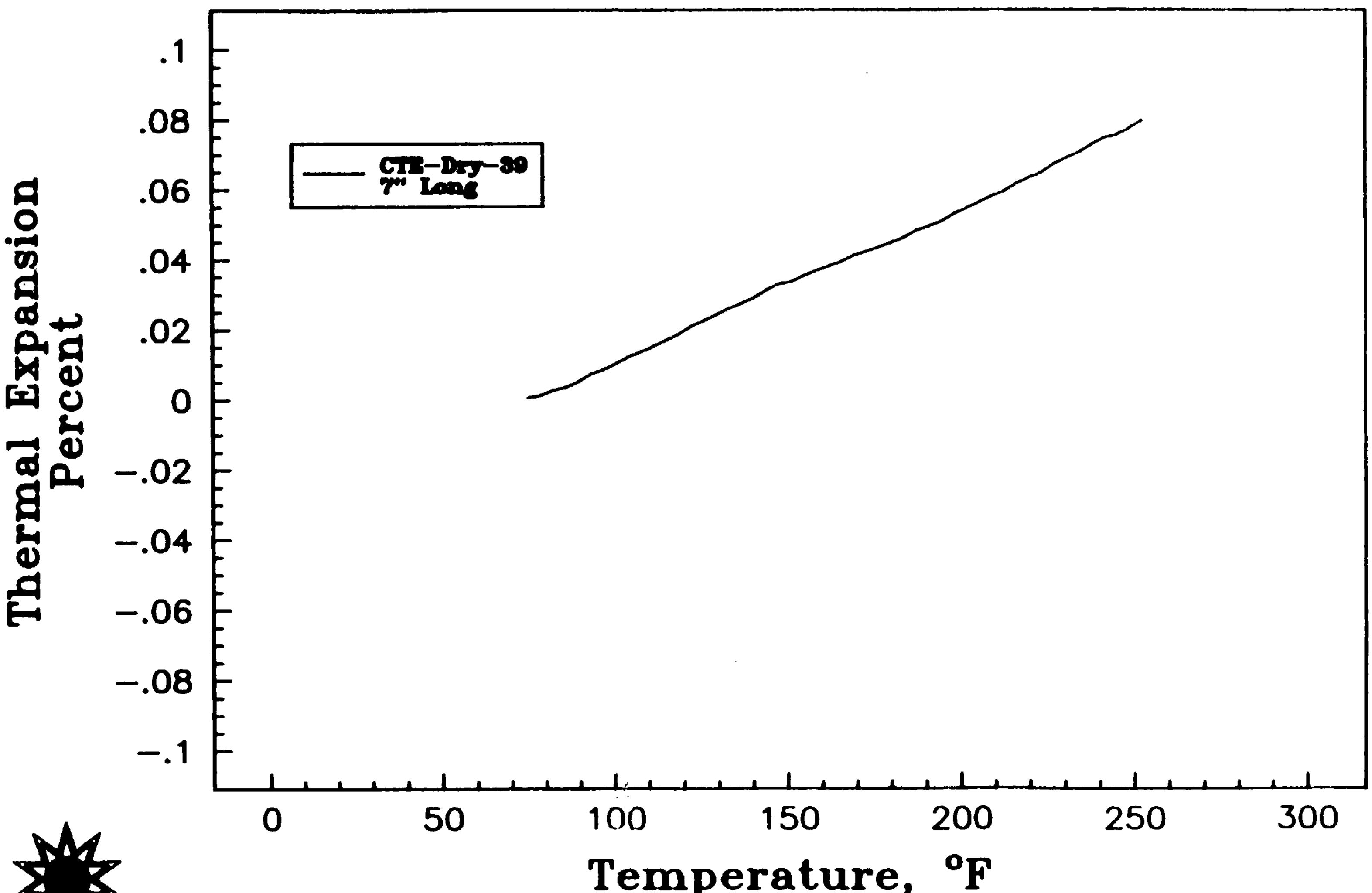
Energy Materials
Testing Laboratory

LE−3025.grf

PVA/MB SOLUBLE CORE THERMAL EXPANSION TEST
BASELINE SAMPLES; NO HIGH HUMIDITY AGING



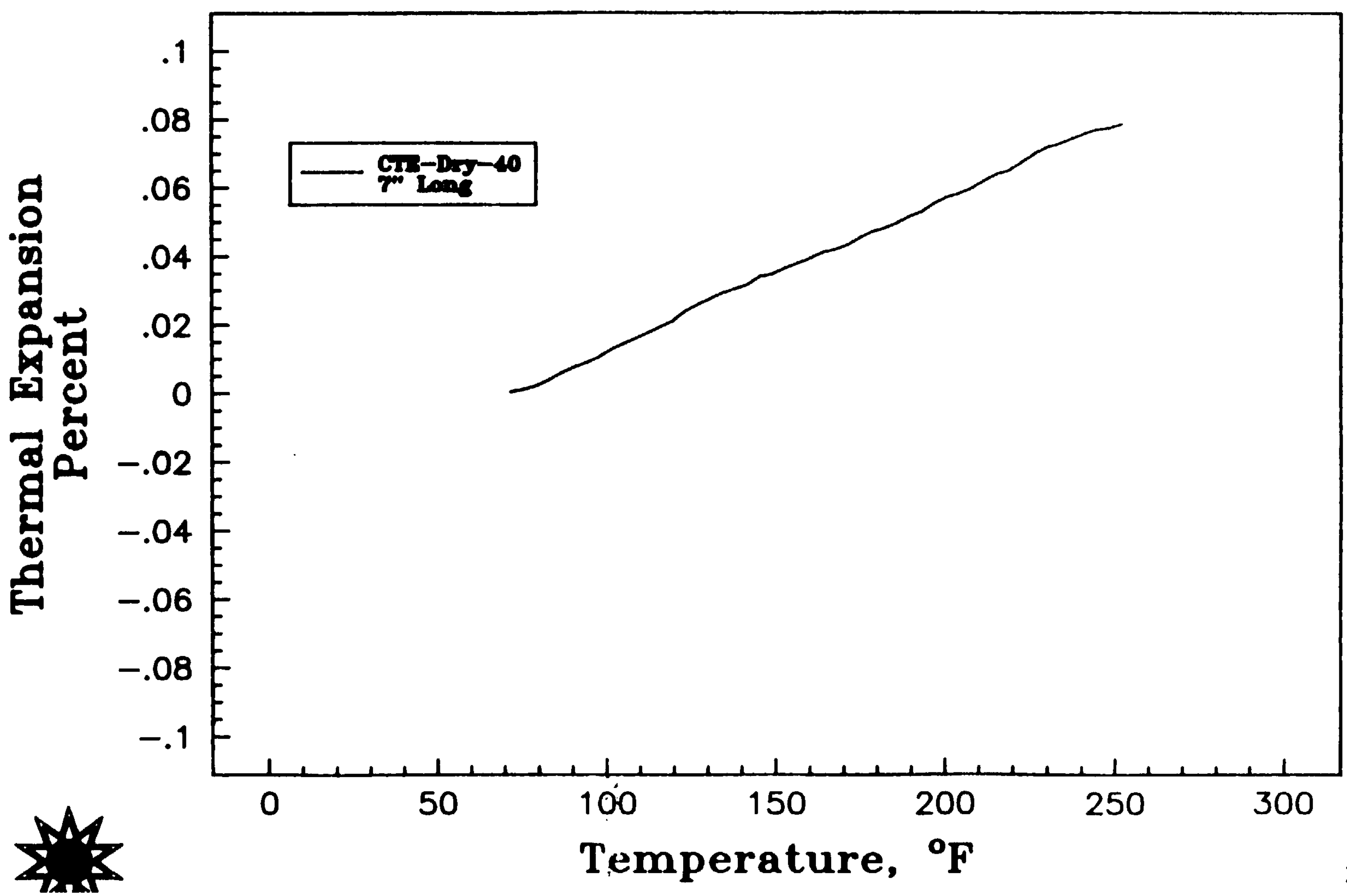
PVA/MB SOLUBLE CORE THERMAL EXPANSION TEST
BASELINE SAMPLES; NO HIGH HUMIDITY AGING



Energy Materials
Testing Laboratory

LE-3027.grf

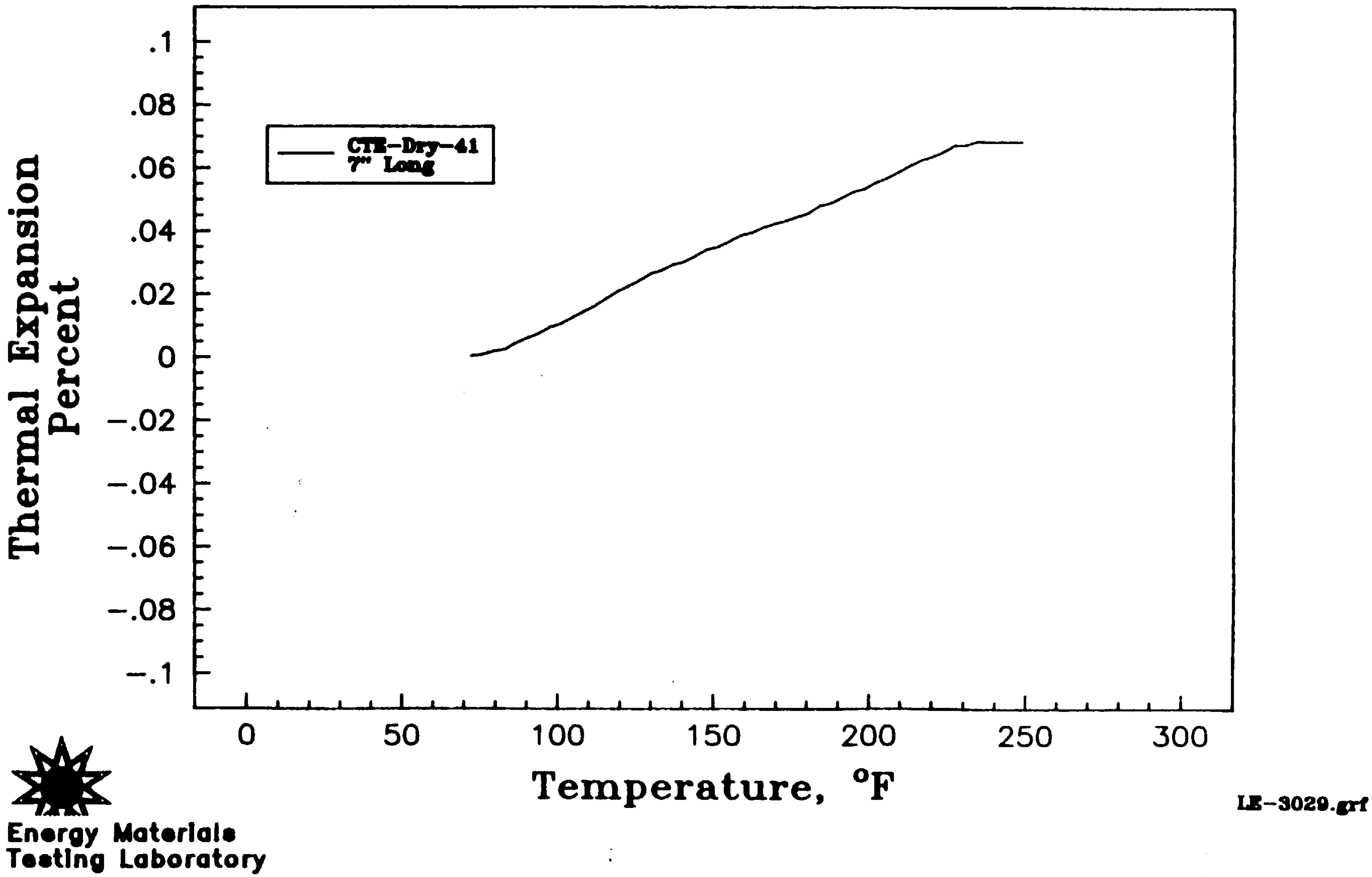
PVA/MB SOLUBLE CORE THERMAL EXPANSION TEST
BASELINE SAMPLES; NO HIGH HUMIDITY AGING



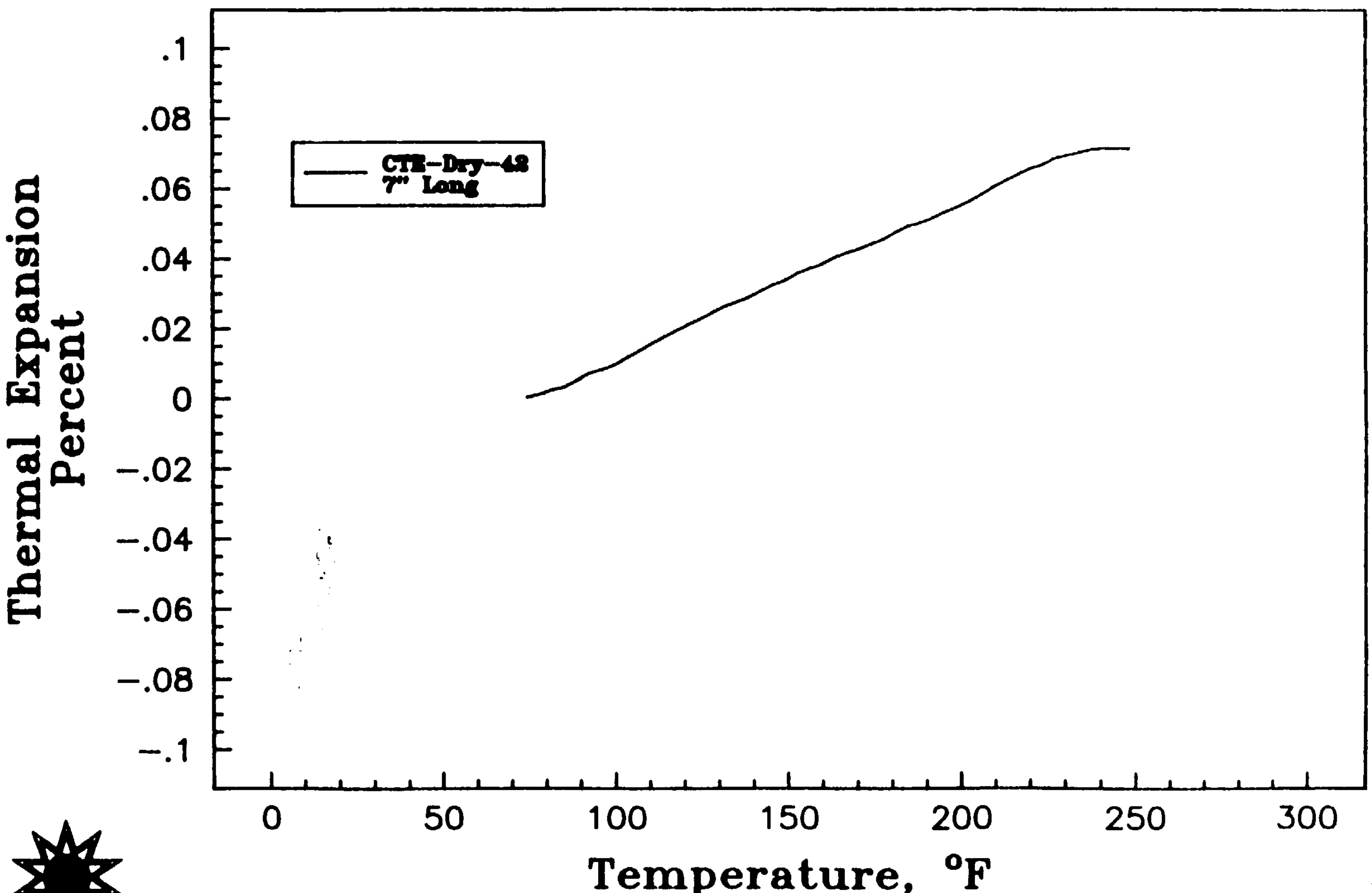
Energy Materials Testing Laboratory

LE-3028.grf

PVA/MB SOLUBLE CORE THERMAL EXPANSION TEST BASELINE SAMPLES; NO HIGH HUMIDITY AGING



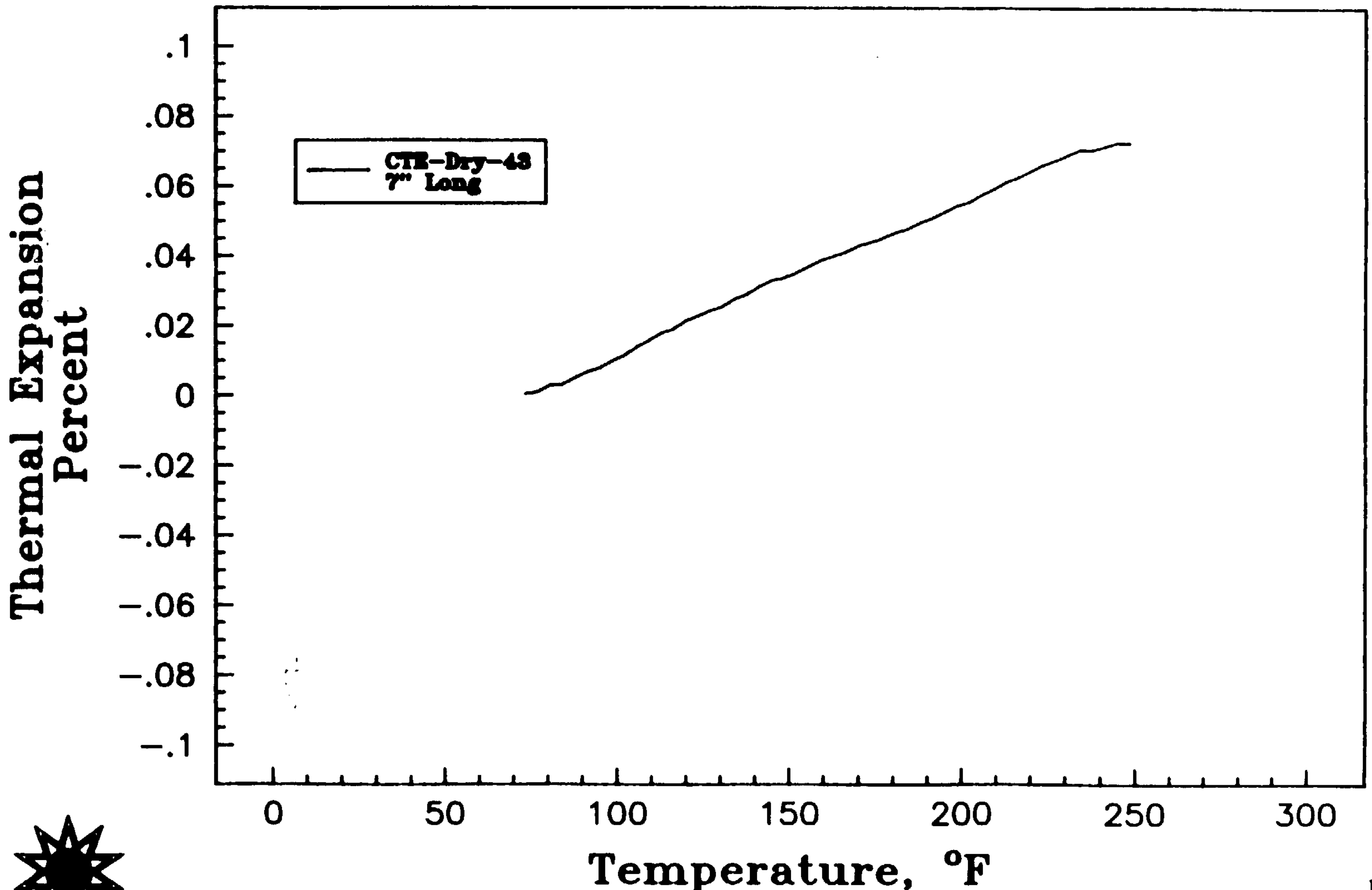
PVA/MB SOLUBLE CORE THERMAL EXPANSION TEST
BASELINE SAMPLES; NO HIGH HUMIDITY AGING



Energy Materials
Testing Laboratory

LE-3030.grf

PVA/MB SOLUBLE CORE THERMAL EXPANSION TEST BASELINE SAMPLES; NO HIGH HUMIDITY AGING



LE-3031.grf

Energy Materials Testing Laboratory

ITE-1,LE-2984

TEMP F	EXP %
75.23723	-2.12592e-4
75.62999	-5.69572e-4
77.05870	-8.39294e-4
78.66035	-1.08387e-3
79.92139	-1.17515e-3
81.06791	-1.25351e-3
82.90484	-1.28218e-3
85.03087	-1.23501e-3
87.38692	-1.17551e-3
88.99679	-1.10199e-3
90.03207	-1.04018e-3
92.56172	-9.30097e-4
94.34221	-9.20494e-4
96.75503	-8.86550e-4
99.51207	-8.65934e-4
101.57870	-8.95007e-4
103.99350	-7.84719e-4
106.17892	-6.61303e-4
108.07525	-6.13729e-4
111.40851	-5.17776e-4
113.36325	-4.32130e-4
116.98627	-2.34887e-4
118.76972	-1.10767e-4
120.72380	-5.05699e-5
122.39142	3.55790e-5
124.51843	1.20922e-4
126.24479	2.57867e-4
128.77674	4.57023e-4
131.02814	9.11164e-4
135.12041	1.48932e-3
139.56579	2.39770e-3
142.22705	3.15652e-3
145.24009	4.19466e-3
148.30793	5.13090e-3
150.56558	5.82680e-3
153.51824	6.75053e-3
156.87649	7.81351e-3
159.13743	8.63665e-3
161.05842	9.63853e-3
164.88626	1.10951e-2
167.61416	1.22101e-2
171.04035	1.36802e-2
173.13263	1.46436e-2
175.40803	1.60266e-2
177.03006	1.65709e-2
179.59752	1.81442e-2
180.99413	1.88544e-2
181.57857	1.92478e-2
183.78898	2.03383e-2
185.12290	2.08449e-2
186.22910	2.14283e-2
189.48664	2.30386e-2
190.53278	2.35203e-2
193.66988	2.49145e-2
195.18265	2.56754e-2
198.55241	2.71837e-2
199.71800	2.78433e-2
202.91286	2.92502e-2
204.94639	3.01628e-2
207.62837	3.17232e-2
209.31901	3.27001e-2

CTE-1

213.35699	3.49698e-2
217.53826	3.58454e-2
219.55300	3.76066e-2
221.47826	3.87739e-2
223.33788	3.96231e-2
226.88090	4.11693e-2
227.98381	4.16255e-2
231.81560	4.32348e-2
236.51237	4.49826e-2
239.35150	4.59574e-2
241.37780	4.65901e-2
243.98460	4.74635e-2
247.16269	4.82214e-2
249.99228	4.88273e-2
252.75853	4.92041e-2
255.52346	4.95301e-2
260.58373	4.97885e-2

CTE-2.LE-2985

TEMP,F	EXP,%
76.59875	1.87930e-4
78.43432	-2.17146e-4
79.69562	-7.23377e-4
81.87526	-1.24236e-3
84.34148	-1.90055e-3
86.34943	-2.24239e-3
88.98951	-2.31860e-3
91.17060	-2.33150e-3
94.72949	-2.25598e-3
96.33656	-2.28147e-3
99.95278	-2.23127e-3
102.53597	-2.13034e-3
106.43925	-2.05486e-3
108.33356	-1.99182e-3
111.37631	-1.76442e-3
114.87809	-1.58768e-3
117.86315	-1.46149e-3
120.56190	-1.09488e-3
123.43344	-5.25861e-4
126.01809	8.11549e-5
128.66064	8.65295e-4
131.01621	1.64946e-3
133.14226	2.45897e-3
135.09600	3.23053e-3
137.73914	4.21711e-3
139.57823	5.03930e-3
142.27971	6.35482e-3
144.29126	7.26556e-3
147.22171	8.36597e-3
149.98102	9.83332e-3
151.93564	1.09085e-2
154.17688	1.18572e-2
156.70631	1.32233e-2
160.15516	1.49563e-2
162.45402	1.59809e-2
165.90316	1.78150e-2
169.29531	1.97884e-2
172.34172	2.12937e-2
173.54929	2.20653e-2
175.90649	2.34188e-2
177.86103	2.44688e-2
179.75793	2.54301e-2
181.02297	2.62271e-2
182.40292	2.70620e-2
184.18483	2.79601e-2
186.42702	2.92377e-2
188.38142	3.02370e-2
189.64620	3.09454e-2
191.14120	3.18688e-2
192.98048	3.27543e-2
194.82008	3.37536e-2
198.49812	3.53473e-2
200.33863	3.66630e-2
202.12058	3.75737e-2
204.13220	3.85098e-2
206.02920	3.95091e-2
208.09912	4.07614e-2
210.05424	4.20138e-2
212.29592	4.31143e-2
214.71052	4.44678e-2

CTE 2

218.56141	4.62891e-2
219.94147	4.71621e-2
222.64219	4.82119e-2
225.22887	4.95275e-2
227.58462	5.03749e-2
229.30892	5.11971e-2
232.29670	5.22722e-2
234.93951	5.31449e-2
237.63961	5.39797e-2
240.22444	5.46499e-2
243.72706	5.51177e-2
247.05723	5.54969e-2
250.21448	5.56230e-2

CTE-3, LE-2986

TEMP,F	EXP,%
75.00352	1.58643e-4
79.59861	-1.66951e-4
82.47222	-4.30735e-4
85.34442	-6.43751e-4
88.27039	-7.29791e-4
91.82479	-7.39075e-4
97.04227	-7.72149e-4
101.91476	-7.67476e-4
107.47015	-5.84455e-4
111.87553	-2.75614e-4
114.84819	1.91609e-5
121.30621	7.23434e-4
124.38535	1.31023e-3
126.88630	2.07417e-3
130.92469	3.20767e-3
132.96740	3.95847e-3
136.03519	4.95142e-3
138.93491	5.80459e-3
141.60854	6.54331e-3
143.93645	7.34516e-3
147.73987	8.68151e-3
149.54797	9.62248e-3
152.78596	1.06790e-2
156.41386	1.21421e-2
157.59991	1.27779e-2
160.44160	1.36564e-2
163.05542	1.44839e-2
165.95231	1.54386e-2
169.41356	1.67111e-2
173.27288	1.80983e-2
175.87287	1.94208e-2
177.57341	2.01078e-2
179.72403	2.10999e-2
181.25367	2.17487e-2
183.28929	2.27533e-2
184.93429	2.33768e-2
187.64927	2.46867e-2
189.12159	2.53355e-2
190.92792	2.63399e-2
193.08137	2.72304e-2
194.26530	2.79423e-2
195.11486	2.83112e-2
197.21277	2.91382e-2
198.50886	2.99391e-2
199.18255	3.04474e-2
201.28259	3.11983e-2
202.80443	3.21263e-2
204.67481	3.28896e-2
207.66471	3.46187e-2
210.33160	3.55985e-2
211.68075	3.65518e-2
212.47122	3.69841e-2
213.99660	3.77851e-2
215.52341	3.85355e-2
217.16273	3.93620e-2
218.06252	3.99848e-2
220.38830	4.08628e-2
221.11542	4.15108e-2

CTE 3

[illegible]	[illegible]
225.19800	4.31140e-2
226.09780	4.37368e-2
227.28669	4.42710e-2
228.36200	4.47670e-2
229.15530	4.50978e-2
230.23345	4.54923e-2
230.91140	4.58483e-2
231.36608	4.59884e-2
232.15690	4.64080e-2
232.77753	4.67640e-2
234.08497	4.71587e-2
235.44264	4.78073e-2
236.23346	4.82269e-2
236.68212	4.85827e-2
237.24790	4.88498e-2
238.38337	4.92444e-2
238.83132	4.96256e-2
239.73750	5.00199e-2
240.41544	5.03759e-2
241.77737	5.08722e-2
242.74371	5.11651e-2
244.39544	5.15474e-2
244.90178	5.18906e-2
245.52488	5.21578e-2
246.26122	5.24758e-2
247.51418	5.27689e-2
249.17265	5.29101e-2

CTE-1

CTE-4, LE-2937

TEMP, F	EXP, %
76.45988	-7.82326e-5
77.32131	3.42333e-5
78.18415	1.84833e-4
79.27369	2.84071e-4
80.07514	3.20397e-4
80.70421	3.31688e-4
81.21711	2.92392e-4
81.84334	2.27414e-4
82.63677	4.76454e-5
83.48545	-1.83098e-4
84.72612	-6.30841e-4
85.62864	-9.50694e-4
86.52927	-1.32139e-3
88.62003	-1.96174e-3
92.93191	-2.81051e-3
94.92067	-3.12011e-3
96.67942	-3.46732e-3
99.74780	-3.94462e-3
102.02747	-4.11503e-3
106.07346	-4.42928e-3
108.75173	-4.63873e-3
111.48810	-4.82289e-3
113.83153	-4.81548e-3
117.31833	-4.79793e-3
119.83462	-4.75277e-3
124.12571	-4.62263e-3
126.41483	-4.53881e-3
128.93772	-4.31569e-3
132.02782	-4.20826e-3
134.26782	-3.90822e-3
137.08116	-3.55863e-3
139.20923	-3.19478e-3
140.93917	-2.77917e-3
142.66770	-2.40170e-3
144.39670	-2.01152e-3
145.60761	-1.72187e-3
146.82230	-1.33053e-3
146.99515	-1.29278e-3
148.49935	-8.00394e-4
150.52399	-1.43917e-4
152.49148	5.12687e-4
154.69936	1.48656e-3
156.61302	2.23227e-3
158.99659	3.32016e-3
159.86793	3.69957e-3
161.84581	4.63583e-3
163.82323	5.55938e-3
165.10687	6.26838e-3
166.44246	6.83742e-3
167.37142	7.22941e-3
167.72468	7.50829e-3
169.18354	8.31859e-3
169.59205	8.54650e-3
171.44715	9.25421e-3
172.89231	9.69588e-3
174.93867	1.09370e-2
176.84949	1.16065e-2
178.48639	1.25944e-2
180.51859	1.34542e-2
180.92899	1.37330e-2

184.37564	1.57465e-2
185.37157	1.64053e-2
187.30185	1.75959e-2
188.87452	1.83932e-2
189.86347	1.88614e-2
190.92844	1.98378e-2
192.67255	2.06348e-2
195.81884	2.22549e-2
197.57145	2.32806e-2
199.21165	2.43575e-2
201.42000	2.53441e-2
202.82313	2.61926e-2
205.39135	2.76361e-2
207.54445	2.86736e-2
210.74741	3.02809e-2
213.19190	3.14703e-2
215.18395	3.27879e-2
216.75946	3.36615e-2
218.04924	3.45358e-2
219.73667	3.53456e-2
221.19364	3.61050e-2
222.76536	3.68769e-2
225.15460	3.81174e-2
227.42293	3.91801e-2
229.12312	4.03331e-2
230.86958	4.11936e-2
234.00879	4.26230e-2
236.85424	4.38370e-2
238.54593	4.47612e-2
240.81095	4.57349e-2
242.61362	4.65699e-2
244.47013	4.73157e-2
246.49430	4.79595e-2
248.58506	4.88574e-2
249.68782	4.93125e-2
251.82156	4.98289e-2

JTE-3, LE-2788

TEMP, F	EXP, %
73.65458	-4.57567e-6
74.89420	-4.77005e-4
76.24284	-1.07657e-3
78.55412	-1.93221e-3
80.75747	-2.63534e-3
82.55879	-3.36288e-3
84.98627	-4.18074e-3
87.47103	-4.99874e-3
90.64584	-5.75498e-3
94.06081	-6.25806e-3
97.19050	-6.73507e-3
99.41539	-6.94346e-3
104.79096	-7.14680e-3
109.32397	-6.96748e-3
113.51001	-6.86345e-3
116.03619	-6.73002e-3
120.05372	-6.54945e-3
122.86683	-6.40403e-3
126.03462	-6.00572e-3
129.44036	-5.40499e-3
133.38034	-4.37420e-3
135.24131	-3.73167e-3
137.32917	-3.14044e-3
138.73966	-2.31919e-3
142.21261	-1.49026e-3
144.01410	-8.98339e-4
147.49478	1.08191e-4
150.11633	1.11680e-3
152.43716	1.79628e-3
156.03791	2.92939e-3
158.65339	3.79846e-3
161.61363	4.69207e-3
165.10038	5.83815e-3
167.53741	6.55540e-3
171.48126	7.67500e-3
174.26691	8.50559e-3
176.93304	9.22229e-3
180.06510	1.01154e-2
183.31392	1.10591e-2
187.42353	1.20387e-2
190.49942	1.29574e-2
193.56923	1.37366e-2
197.62322	1.47544e-2
201.15510	1.56213e-2
203.47537	1.62881e-2
205.50706	1.69048e-2
209.03397	1.76575e-2
212.16548	1.85380e-2
215.80804	1.93158e-2
218.17951	1.98429e-2
222.85855	2.07450e-2
225.80222	2.12580e-2
228.79985	2.16948e-2
232.42309	2.20286e-2
235.82274	2.24898e-2
240.35465	2.26437e-2
243.21895	2.26495e-2
248.31477	2.25990e-2
252.32899	2.27035e-2
253.98776	2.26487e-2

CTE-5, LE-2989

TEMP, F	EXP, %
73.96524	-7.33597e-5
73.93778	-6.71251e-4
74.19209	-1.38439e-3
74.43880	-2.26291e-3
75.53958	-3.29637e-3
75.90169	-4.16247e-3
76.78162	-5.00450e-3
77.31653	-5.85834e-3
78.72947	-6.34556e-3
80.29709	-7.21486e-3
81.58645	-7.89259e-3
83.55942	-8.68664e-3
84.85463	-9.23715e-3
86.32672	-9.68636e-3
87.85739	-1.01102e-2
90.18765	-1.06253e-2
91.89054	-1.10497e-2
93.37432	-1.12445e-2
95.60204	-1.14921e-2
97.71319	-1.17776e-2
99.71129	-1.20247e-2
101.77613	-1.20683e-2
105.15605	-1.22300e-2
108.02166	-1.23394e-2
111.47067	-1.22468e-2
113.77157	-1.21511e-2
115.49958	-1.20285e-2
118.43194	-1.19345e-2
121.76614	-1.18416e-2
124.12561	-1.17206e-2
127.91905	-1.16289e-2
131.94329	-1.15124e-2
134.76317	-1.13672e-2
140.07137	-1.07961e-2
142.84436	-1.04218e-2
146.31558	-9.84579e-3
150.07849	-9.16876e-3
152.22996	-8.57652e-3
155.30225	-7.93583e-3
159.71065	-6.95518e-3
163.09159	-5.84457e-3
165.52951	-5.26581e-3
168.50101	-4.31951e-3
173.20929	-3.05975e-3
177.28027	-1.92553e-3
180.30509	-1.06843e-3
183.27602	-1.34858e-4
187.40907	1.10097e-3
190.04374	2.21356e-3
193.63561	2.91649e-3
195.84682	3.55946e-3
198.17226	4.18942e-3
201.37397	5.14783e-3
205.08006	5.83772e-3
209.94420	6.74083e-3
212.96494	7.50888e-3
216.91000	8.40170e-3
220.56103	9.14264e-3
223.86294	9.78272e-3
227.44312	1.02312e-2

C-E-6

235.23378	1.11011e-2
238.51408	1.12705e-2
242.59806	1.14377e-2
246.67970	1.15541e-2
250.69926	1.15689e-2
253.16302	1.14605e-2

UTE-7, LE-2990

TEMP, F	EXP, %
75.84577	2.18328e-4
76.33637	-1.87898e-4
76.19690	-6.04391e-4
77.65095	-1.16588e-3
77.85398	-1.59630e-3
78.39040	-2.19225e-3
79.51334	-2.55031e-3
80.23430	-2.93213e-3
82.20097	-3.53347e-3
83.32163	-3.92943e-3
85.19589	-4.16394e-3
87.30279	-4.33615e-3
90.21442	-4.44820e-3
92.62027	-4.40671e-3
95.48380	-4.36694e-3
99.14826	-4.33018e-3
102.41606	-4.22874e-3
106.03318	-4.02753e-3
109.82042	-3.85223e-3
113.84257	-3.57671e-3
116.82811	-3.41103e-3
118.79754	-3.01406e-3
121.86382	-2.45694e-3
123.89956	-1.90858e-3
125.81861	-1.39768e-3
127.45465	-8.35184e-4
128.32114	-6.99439e-4
130.42397	1.29510e-5
132.81740	8.00069e-4
134.80808	1.55079e-3
137.55387	2.48822e-3
140.13411	3.52738e-3
142.88067	4.47744e-3
144.81262	5.20312e-3
147.20908	6.04077e-3
149.43923	6.96751e-3
151.26587	7.84522e-3
154.35721	8.81926e-3
156.92302	9.61837e-3
158.23402	1.04853e-2
162.49763	1.19225e-2
164.38376	1.28379e-2
167.06704	1.36871e-2
171.03549	1.49738e-2
173.65928	1.57853e-2
176.75061	1.67594e-2
179.97154	1.79857e-2
183.99493	1.92342e-2
187.07640	2.00440e-2
191.08992	2.11283e-2
194.16987	2.19129e-2
196.68303	2.27880e-2
199.13518	2.36002e-2
201.17472	2.42117e-2
205.71680	2.55215e-2
208.69902	2.65844e-2
210.57149	2.72724e-2
213.59498	2.80698e-2
215.74591	2.86303e-2
219.85259	2.93605e-2
222.11566	2.98827e-2

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228.18191	3.08455e-2
231.29249	3.11877e-2
233.42368	3.14198e-2
236.47478	3.17242e-2
239.74485	3.18635e-2
242.61142	3.19538e-2
245.93338	3.20045e-2
249.93883	3.20021e-2
252.96640	3.19149e-2

ITE-B, LE-2991

TEMP, F	EXP, %
75.09281	-1.82028e-4
75.18977	-6.15940e-4
75.61889	-1.34381e-3
76.22168	-2.03371e-3
76.77076	-2.63421e-3
78.00926	-3.21033e-3
78.85353	-3.60720e-3
80.20937	-4.11972e-3
80.20781	-4.15799e-3
82.13835	-4.64595e-3
83.67361	-4.98017e-3
85.38148	-5.30191e-3
87.89037	-5.67600e-3
93.66854	-6.06823e-3
96.53312	-6.16224e-3
99.28611	-6.17952e-3
103.24899	-6.07122e-3
104.92041	-5.88261e-3
108.31278	-5.69683e-3
110.09736	-5.54667e-3
116.25160	-5.16131e-3
119.36394	-4.80922e-3
121.90628	-4.36689e-3
125.26429	-3.61972e-3
127.59286	-2.79432e-3
131.19443	-1.70310e-3
133.75298	-8.65324e-4
136.83775	2.13984e-4
140.27978	1.61164e-3
142.09311	2.46340e-3
144.83264	3.51776e-3
146.82173	4.45854e-3
149.79647	5.65285e-3
152.12452	6.46550e-3
154.35300	7.64827e-3
156.52045	8.74185e-3
159.62351	1.02676e-2
162.20559	1.16794e-2
164.78976	1.31423e-2
167.25135	1.44140e-2
170.75493	1.59136e-2
172.34037	1.68040e-2
174.21106	1.76557e-2
176.84057	1.88250e-2
178.18924	1.95372e-2
180.82240	2.07959e-2
185.43159	2.26764e-2
187.66320	2.39357e-2
190.42051	2.54238e-2
193.10477	2.65293e-2
195.49698	2.75077e-2
197.48032	2.83081e-2
199.57890	2.91212e-2
202.73149	3.04555e-2
204.07597	3.10656e-2
207.39857	3.23487e-2
209.32140	3.30727e-2
213.15348	3.41891e-2
215.71465	3.50906e-2
217.51752	3.56873e-2
220.47763	3.65244e-2

CTE-8

225.94206	3.82759e-2
228.02810	3.87828e-2
230.29251	3.94424e-2
233.24112	3.99939e-2
235.55140	4.03778e-2
237.91694	4.07056e-2
241.89603	4.12094e-2
245.23155	4.14080e-2
248.61660	4.14152e-2
253.03160	4.13569e-2

CTE-9. LE-2997

TEMP, F	uncorr.	EXP, %
70.88257	0.000169	0.000048
71.34881	-0.00058	-0.00016
72.10568	-0.00172	-0.00049
72.91556	-0.00228	-0.00065
74.58631	-0.00258	-0.00073
76.48465	-0.00256	-0.00073
78.15289	-0.00254	-0.00072
80.05073	-0.00246	-0.00070
81.832	-0.00219	-0.00062
83.55927	-0.00236	-0.00067
85.97735	-0.00259	-0.00073
88.05329	-0.00320	-0.00091
89.55448	-0.00389	-0.00110
91.34632	-0.00495	-0.00141
92.96758	-0.00626	-0.00178
94.53384	-0.00789	-0.00224
96.39023	-0.00984	-0.00280
97.7299	-0.01192	-0.00339
99.24064	-0.01381	-0.00393
100.8119	-0.01607	-0.00458
102.2691	-0.01847	-0.00526
103.3207	-0.02049	-0.00583
104.6648	-0.02314	-0.00659
107.1166	-0.02762	-0.00786
108.8095	-0.03071	-0.00874
110.8570	-0.03500	-0.00997
112.4399	-0.03872	-0.01103
114.1448	-0.04333	-0.01234
116.1954	-0.04801	-0.01367
118.9054	-0.05603	-0.01596
120.9705	-0.06254	-0.01781
124.2199	-0.07329	-0.02087
125.9409	-0.07993	-0.02277
128.0741	-0.08777	-0.02500
130.2709	-0.09638	-0.02745
132.5418	-0.10707	-0.03049
135.2662	-0.12417	-0.03537
136.8237	-0.13195	-0.03758
139.3973	-0.14454	-0.04117
142.8004	-0.16017	-0.04562
146.1975	-0.17504	-0.04986
149.3315	-0.19302	-0.05498
150.6574	-0.20062	-0.05714
151.9408	-0.21012	-0.05985
153.8025	-0.21999	-0.06266
154.9634	-0.22854	-0.06510
157.0011	-0.23885	-0.06803
158.3371	-0.24772	-0.07056
159.3233	-0.25602	-0.07292
161.5342	-0.26639	-0.07588
164.1987	-0.27594	-0.07860
164.9348	-0.28171	-0.08024
166.9964	-0.28777	-0.08197
169.4653	-0.29441	-0.08386
171.8241	-0.30168	-0.08593
174.1128	-0.30736	-0.08755

CTE-9

179.4291	-0.31758	-0.09046
182.3420	-0.32218	-0.09177
185.0748	-0.32583	-0.09281
187.2799	-0.32822	-0.09349
189.3619	-0.32959	-0.09388
192.2972	-0.32975	-0.09393
194.8172	-0.32833	-0.09352
196.3548	-0.32635	-0.09296
199.8282	-0.32181	-0.09167
203.0710	-0.31721	-0.09036
206.8169	-0.31077	-0.08852
209.7165	-0.30643	-0.08728
212.6161	-0.30209	-0.08605
216.7092	-0.29589	-0.08428
219.8844	-0.29003	-0.08261
224.0855	-0.28295	-0.08060
228.6862	-0.27548	-0.07847
233.3415	-0.26763	-0.07623
238.1143	-0.2601	-0.07409
242.3654	-0.25207	-0.07180
246.5100	-0.24511	-0.06982
249.4005	-0.23963	-0.06826
250.9366	-0.23746	-0.06764

CTE-10, LE-2998

TEMP, F	uncorr.	EXP, %
72.86256	0.000602	0.000172
74.4704	0.000934	0.000266
75.3291	0.001514	0.000432
76.01656	0.001901	0.000542
77.73313	0.003187	0.000909
79.85302	0.004349	0.001241
82.65911	0.006089	0.001737
84.95107	0.007317	0.002088
88.85045	0.008939	0.002551
90.85826	0.009656	0.002755
93.6748	0.009808	0.002799
97.2388	0.009966	0.002844
99.13537	0.010110	0.002885
100.6319	0.009869	0.002816
101.8406	0.009689	0.002765
103.1114	0.008810	0.002514
104.9080	0.006665	0.001902
107.518	0.003257	0.000929
109.5558	-0.00060	-0.00017
111.5979	-0.00509	-0.00145
113.9362	-0.01092	-0.00311
115.7516	-0.01592	-0.00454
117.9195	-0.02206	-0.00629
119.9724	-0.02821	-0.00805
122.2712	-0.03677	-0.01049
125.0412	-0.04704	-0.01342
127.9458	-0.06029	-0.01720
130.1363	-0.06987	-0.01994
132.2197	-0.08065	-0.02301
134.1302	-0.09138	-0.02607
136.3348	-0.10311	-0.02942
139.0924	-0.12024	-0.03431
143.2084	-0.14283	-0.04076
146.3281	-0.16257	-0.04639
149.6736	-0.18166	-0.05184
152.0612	-0.19499	-0.05564
154.7984	-0.20901	-0.05964
156.9397	-0.21985	-0.06274
158.7822	-0.22899	-0.06535
161.7494	-0.243	-0.06934
163.9294	-0.25099	-0.07162
165.7502	-0.25682	-0.07329
167.9790	-0.26347	-0.07519
169.8519	-0.26848	-0.07662
171.4885	-0.27253	-0.07777
173.8151	-0.27658	-0.07893
176.4826	-0.27998	-0.07990
178.6204	-0.28155	-0.08035
182.1344	-0.28254	-0.08063
184.6085	-0.28277	-0.08069
187.1963	-0.28281	-0.08071
189.4378	-0.28267	-0.08067
192.0185	-0.28163	-0.08037
194.9938	-0.27938	-0.07973
197.5649	-0.27688	-0.07901
201.0447	-0.27265	-0.07781
203.6074	-0.26888	-0.07673
206.9668	-0.26383	-0.07529

CTE-10

212.8550	-0.25329	-0.07228
215.2461	-0.24964	-0.07124
218.7530	-0.24613	-0.07024
221.5403	-0.24153	-0.06892
224.1564	-0.23712	-0.06767
226.6029	-0.23316	-0.06654
229.6764	-0.22837	-0.06517
232.8708	-0.22446	-0.06405
236.8681	-0.22023	-0.06285
239.1504	-0.21754	-0.06208
244.0618	-0.21242	-0.06062
247.2041	-0.20934	-0.05974
250.1164	-0.20626	-0.05886
252.4605	-0.20421	-0.05827

CTE-11, LE-2999

TEMP, F	uncorr.	EXP, %
74.94769	0.000058	0.000016
78.73716	-0.00028	-0.00008
83.21779	-0.00025	-0.00007
88.90561	-0.00003	-0.00001
93.50144	0.000059	0.000016
96.94689	-0.00015	-0.00004
99.63869	-0.00175	-0.00050
102.2676	-0.00443	-0.00126
104.8900	-0.00844	-0.00240
108.6429	-0.01612	-0.00459
111.5945	-0.02324	-0.00662
114.9355	-0.03289	-0.00937
118.0989	-0.04361	-0.01243
121.4191	-0.05744	-0.01637
125.5221	-0.07558	-0.02154
127.7036	-0.08737	-0.02491
129.8886	-0.09847	-0.02807
131.9625	-0.10881	-0.03102
134.7701	-0.12175	-0.03471
136.6717	-0.13208	-0.03765
138.5187	-0.14185	-0.04044
141.2692	-0.15472	-0.04411
142.0595	-0.15751	-0.04490
143.2573	-0.15923	-0.04539
144.9697	-0.1614	-0.04601
147.2522	-0.16445	-0.04688
150.1640	-0.16802	-0.04790
153.2405	-0.17311	-0.04935
156.9420	-0.17959	-0.05120
160.8066	-0.18791	-0.05357
165.1279	-0.19681	-0.05611
168.4272	-0.20329	-0.05795
171.8437	-0.20933	-0.05968
175.7780	-0.21518	-0.06134
178.1164	-0.21856	-0.06231
181.2589	-0.22193	-0.06327
184.5778	-0.22449	-0.06400
188.3007	-0.22667	-0.06462
192.3754	-0.22739	-0.06482
196.1652	-0.22767	-0.06490
206.1058	-0.22704	-0.06472
209.2170	-0.22516	-0.06419
212.4469	-0.22252	-0.06344
215.2785	-0.21912	-0.06247
218.4585	-0.21497	-0.06128
221.4640	-0.21125	-0.06022
224.3003	-0.2069	-0.05898
227.6002	-0.20173	-0.05751
230.7824	-0.19713	-0.05620
236.3332	-0.18982	-0.05411
239.6265	-0.18598	-0.05302
242.4559	-0.18302	-0.05217
245.2850	-0.18012	-0.05135
249.8379	-0.17712	-0.05049
252.1424	-0.17574	-0.05010
252.4296	-0.17574	-0.05010

CTE-12. LE-3000

TEMP, F	uncorr.	EXP, %
70.59307	-0.00030	-0.00008
71.74858	-0.00079	-0.00022
73.30268	-0.00095	-0.00027
75.0097	0.000524	0.000149
77.27948	0.003032	0.000863
80.51359	0.006633	0.001889
83.90814	0.011252	0.003204
87.01905	0.015549	0.004428
91.43765	0.021071	0.006000
96.20336	0.026408	0.007520
101.2534	0.032002	0.009113
105.0653	0.035358	0.010069
108.3764	0.037311	0.010625
112.6191	0.038262	0.010896
116.0064	0.038630	0.011001
118.3024	0.038918	0.011083
121.1240	0.038516	0.010968
123.606	0.037665	0.010726
125.9835	0.035925	0.010230
128.4275	0.033423	0.009518
130.8215	0.030287	0.008625
134.4055	0.023743	0.006761
137.1236	0.017503	0.004984
140.6257	0.008166	0.002325
144.4422	-0.00344	-0.00098
147.6354	-0.01583	-0.00450
149.9797	-0.02449	-0.00697
151.8590	-0.03271	-0.00931
154.5267	-0.04440	-0.01264
157.3938	-0.05838	-0.01662
160.2722	-0.07331	-0.02087
162.899	-0.08640	-0.02460
164.3147	-0.09431	-0.02685
168.5013	-0.11778	-0.03354
171.0221	-0.13164	-0.03748
174.1641	-0.14942	-0.04255
176.0159	-0.16018	-0.04561
178.0946	-0.17068	-0.04860
180.3540	-0.18187	-0.05179
182.6618	-0.19231	-0.05476
185.2011	-0.20286	-0.05777
187.7261	-0.21221	-0.06043
189.9382	-0.21941	-0.06248
192.3280	-0.22705	-0.06465
195.7576	-0.23512	-0.06695
198.1681	-0.23965	-0.06824
201.4437	-0.24443	-0.06960
203.9437	-0.2468	-0.07028
207.1281	-0.24872	-0.07082
210.1848	-0.24956	-0.07106
213.7506	-0.2497	-0.07110
217.1931	-0.24914	-0.07094
219.9400	-0.24808	-0.07064
223.9855	-0.24504	-0.06978
228.0205	-0.24111	-0.06866
232.2727	-0.2361	-0.06723
236.6981	-0.23115	-0.06582
240.7158	-0.22576	-0.06429

246.7750	-0.21799	-0.06207
249.0947	-0.21485	-0.06118
251.5832	-0.21139	-0.06019

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CTE-13, LE-3001

TEMP, F	uncorr.	EXP, %
71.45834	-0.00163	-0.00046
73.45278	-0.00111	-0.00031
75.95199	0.001061	0.000302
78.32725	0.005077	0.001448
80.75688	0.009600	0.002738
83.18481	0.014442	0.004119
85.38618	0.018964	0.005410
88.94249	0.026226	0.007481
92.78951	0.032473	0.009263
95.2789	0.036489	0.010409
99.07529	0.041528	0.011846
103.3285	0.046507	0.013266
107.3612	0.050023	0.014269
110.6620	0.051692	0.014746
114.1947	0.052664	0.015023
116.6470	0.052931	0.015099
119.2151	0.052882	0.015085
119.3860	0.052946	0.015103
119.4430	0.052946	0.015103
119.3853	0.053073	0.015140
119.6136	0.053074	0.015140
121.8403	0.052832	0.015071
123.4995	0.052015	0.014838
126.2554	0.048853	0.013936
128.5571	0.045244	0.012906
131.3279	0.039287	0.011207
132.9493	0.034849	0.009941
135.6191	0.026413	0.007534
138.1714	0.018612	0.005309
140.9723	0.007001	0.001997
143.8903	-0.00518	-0.00147
146.8776	-0.01965	-0.00560
149.8649	-0.03411	-0.00973
152.1063	-0.04783	-0.01364
154.5183	-0.06141	-0.01751
157.1808	-0.07918	-0.02258
160.2637	-0.1009	-0.02878
162.3896	-0.11435	-0.03262
164.8718	-0.13041	-0.03720
166.8215	-0.14292	-0.04077
169.6025	-0.16152	-0.04607
171.9692	-0.17733	-0.05058
174.3910	-0.19275	-0.05498
178.0445	-0.21446	-0.06117
181.1065	-0.23223	-0.06624
183.6285	-0.24505	-0.06990
187.3812	-0.26396	-0.07529
190.8844	-0.27888	-0.07955
194.6047	-0.29169	-0.08320
197.8536	-0.30171	-0.08606
200.4488	-0.30684	-0.08753
202.9234	-0.31077	-0.08865
205.2782	-0.31361	-0.08946
207.7990	-0.31551	-0.09000
210.5994	-0.31632	-0.09023
214.2554	-0.31706	-0.09044
217.8500	-0.31698	-0.09042
221.7295	-0.31683	-0.09038

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230.3153	-0.31107	-0.08873
236.0521	-0.30608	-0.08731
243.0912	-0.29918	-0.08534
248.8773	-0.29273	-0.08350
251.6581	-0.28986	-0.08268

CTE-14. LE-3002

TEMP, F	uncorr.	EXP, %
71.88793	0.049923	0.014221
77.3321	0.052082	0.014836
85.06849	0.055467	0.015800
97.96245	0.061373	0.017482
106.6159	0.063888	0.018199
114.2952	0.065682	0.018710
119.5104	0.065961	0.018789
124.7830	0.065734	0.018725
127.7631	0.065583	0.018682
134.4126	0.055299	0.015752
136.4192	0.050377	0.014350
139.4579	0.041546	0.011834
142.3248	0.031559	0.008989
145.0201	0.019474	0.005547
147.3139	0.010211	0.002908
150.1814	-0.00411	-0.00117
154.0244	-0.02625	-0.00747
157.1221	-0.04716	-0.01343
161.7112	-0.07668	-0.02184
168.0216	-0.12089	-0.03443
173.1856	-0.16314	-0.04647
177.4883	-0.19389	-0.05523
180.9872	-0.21502	-0.06125
183.2248	-0.2321	-0.06611
186.2073	-0.2491	-0.07095
190.1646	-0.26914	-0.07666
194.3509	-0.28745	-0.08188
199.3965	-0.30374	-0.08652
203.0656	-0.31242	-0.08899
208.7979	-0.3209	-0.09141
211.8356	-0.32271	-0.09192
216.4205	-0.32366	-0.09219
220.6042	-0.32352	-0.09215
224.5012	-0.32302	-0.09201
228.8563	-0.31992	-0.09113
235.3884	-0.31118	-0.08864
240.4308	-0.30447	-0.08673
245.0146	-0.29731	-0.08469
249.1400	-0.29125	-0.08296
252.4059	-0.28532	-0.08127
253.4371	-0.28286	-0.08057

CTE-15, LE-3003

TEMP, F	uncorr.	EXP, %
75.23119	-0.00072	-0.00020
78.15715	-0.00133	-0.00037
80.62441	-0.00188	-0.00053
82.3437	-0.00199	-0.00056
85.08916	-0.00146	-0.00041
87.47939	0.000588	0.000167
90.2595	0.004102	0.001167
92.87018	0.007297	0.002076
96.21342	0.012085	0.003438
99.38724	0.016554	0.004710
101.9396	0.019876	0.005655
105.2323	0.023775	0.006764
108.4764	0.026531	0.007549
112.0695	0.028592	0.008135
115.4956	0.030017	0.008541
118.1818	0.030802	0.008764
121.6160	0.031148	0.008862
123.9071	0.031167	0.008868
126.4870	0.030872	0.008784
129.0188	0.029370	0.008357
130.5821	0.027162	0.007728
132.8944	0.024390	0.006939
135.1610	0.020093	0.005717
137.147	0.015033	0.004277
139.1305	0.010290	0.002928
138.4889	0.011808	0.003359
141.4751	0.003266	0.000929
144.7640	-0.00743	-0.00211
148.5415	-0.02212	-0.00629
153.4544	-0.04302	-0.01224
157.3874	-0.06310	-0.01795
161.3912	-0.08496	-0.02417
166.0991	-0.11659	-0.03317
169.5474	-0.14074	-0.04004
173.7024	-0.16742	-0.04763
177.7470	-0.19468	-0.05539
181.9154	-0.22314	-0.06349
184.9074	-0.23999	-0.06828
188.1949	-0.25805	-0.07342
191.2957	-0.27414	-0.07800
194.7290	-0.28877	-0.08216
198.5614	-0.30315	-0.08625
201.4932	-0.31207	-0.08879
205.3318	-0.31972	-0.09097
208.3473	-0.32458	-0.09235
211.8662	-0.32785	-0.09328
216.6299	-0.32908	-0.09363
221.2694	-0.32904	-0.09362
224.1323	-0.32889	-0.09358
226.5316	-0.32804	-0.09333
230.4592	-0.32477	-0.09240
234.8378	-0.32055	-0.09120
239.1576	-0.31613	-0.08995
243.3653	-0.31203	-0.08878
248.2637	-0.30837	-0.08774
251.2263	-0.30626	-0.08714
252.6486	-0.30497	-0.08677

CTE-20, LE-3008

TEMP, F	EXP, %
73.80358	6.70277e-6
76.70360	8.00849e-4
79.26240	1.55886e-3
82.21903	2.69574e-3
87.50705	4.46434e-3
93.13618	6.41337e-3
98.65160	8.30827e-3
100.81236	8.95799e-3
103.02981	9.82418e-3
105.01984	1.06001e-2
110.70589	1.24950e-2
115.53871	1.45161e-2
119.51889	1.59057e-2
124.35176	1.78546e-2
129.07077	1.99478e-2
136.23478	2.28531e-2
139.36188	2.41704e-2
142.31848	2.53433e-2
145.67313	2.66065e-2
148.91408	2.78156e-2
151.30218	2.86638e-2
155.96497	2.99272e-2
158.01192	3.06491e-2
161.99219	3.19304e-2
163.75479	3.26162e-2
166.37033	3.35365e-2
169.27018	3.45471e-2
172.62509	3.54857e-2
175.86625	3.64242e-2
179.50534	3.76153e-2
182.51893	3.86439e-2
186.10107	3.99252e-2
188.48919	4.07554e-2
191.33216	4.17660e-2
194.06140	4.27585e-2
197.87090	4.42202e-2
200.94127	4.53571e-2
204.80753	4.69631e-2
208.90140	4.84429e-2
212.42659	4.98144e-2
215.89491	5.11859e-2
218.56720	5.22686e-2
222.43343	5.39107e-2
225.10565	5.50836e-2
228.97175	5.68880e-2
231.58717	5.79707e-2
233.86131	5.90714e-2
236.24927	6.01000e-2
238.35300	6.09301e-2
240.51363	6.17422e-2
242.56039	6.26985e-2
244.55033	6.35827e-2
246.48331	6.45751e-2
248.41626	6.56036e-2
250.17867	6.65238e-2
252.22558	6.72818e-2
252.96468	6.76427e-2

CTE-21, LE-3009

TEMP, F	EXP, %
70.22649	2.03966e-4
71.54635	3.11649e-4
72.29209	4.73568e-4
74.07002	9.95509e-4
75.73292	1.60757e-3
77.28116	2.16562e-3
79.05847	2.92179e-3
80.43466	3.42584e-3
82.32701	4.09189e-3
83.87457	4.90218e-3
85.19303	5.53237e-3
86.51188	6.01843e-3
88.06008	6.59449e-3
89.60798	7.27867e-3
90.98384	7.90884e-3
93.79305	9.13314e-3
97.17716	1.00149e-2
99.46935	1.14015e-2
102.50772	1.27879e-2
104.80097	1.37781e-2
107.66719	1.51465e-2
109.33014	1.57406e-2
111.68070	1.67668e-2
114.14605	1.77930e-2
115.63627	1.85853e-2
117.52817	1.94135e-2
120.22288	2.05298e-2
122.57329	2.16101e-2
125.15305	2.27804e-2
126.87301	2.35186e-2
129.16646	2.44367e-2
132.43471	2.57149e-2
136.73510	2.73712e-2
138.39766	2.81093e-2
141.37911	2.93156e-2
143.73001	3.02157e-2
146.48221	3.12959e-2
148.54645	3.20700e-2
150.72525	3.29341e-2
152.21600	3.35282e-2
155.25529	3.45723e-2
157.03288	3.52203e-2
159.21207	3.59403e-2
162.36610	3.70024e-2
165.00375	3.79925e-2
167.29739	3.88386e-2
169.41908	3.95946e-2
172.34357	4.06387e-2
175.49693	4.19530e-2
177.27428	4.26911e-2
179.91130	4.39155e-2
181.57400	4.45996e-2
183.81020	4.54638e-2
186.33314	4.64179e-2
190.11763	4.78220e-2
193.21364	4.91183e-2
196.48184	5.04145e-2
199.52059	5.16568e-2
202.50175	5.29711e-2
204.50802	5.39614e-2
206.51419	5.49878e-2

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210.81391	5.68963e-2
213.62047	5.81386e-2
216.54664	5.95250e-2
218.03691	6.02993e-2
220.78862	6.15596e-2
223.82655	6.31082e-2
226.29127	6.43686e-2
229.21480	6.57731e-2
231.33537	6.69435e-2
234.08680	6.83120e-2
236.32217	6.94824e-2
238.95924	7.06887e-2
241.13726	7.18412e-2
244.06088	7.32096e-2
247.27042	7.49743e-2
250.13650	7.63967e-2
251.74161	7.71530e-2

DTE-22, LE-3010

TEMP, F	EXP, %
71.70889	-1.28192e-4
73.59745	-3.48101e-5
75.82639	2.03261e-4
77.70438	7.46905e-4
80.31577	1.77814e-3
82.30074	2.64617e-3
84.05230	3.69391e-3
87.40300	4.96060e-3
90.06576	6.24408e-3
93.24205	7.61853e-3
95.56824	8.59523e-3
98.11979	9.73444e-3
100.16206	1.06025e-2
102.48613	1.16693e-2
104.92225	1.28443e-2
107.35922	1.39833e-2
111.04438	1.56468e-2
115.06654	1.75991e-2
118.62992	1.95686e-2
121.06773	2.06716e-2
124.86283	2.25334e-2
127.24039	2.37624e-2
129.96044	2.50460e-2
132.73652	2.63837e-2
136.30752	2.80290e-2
139.25674	2.93130e-2
142.14741	3.06509e-2
146.39916	3.25856e-2
151.89275	3.53150e-2
155.57918	3.69245e-2
160.34360	3.89861e-2
163.46344	4.03245e-2
167.49786	4.17545e-2
170.38937	4.30564e-2
173.56227	4.45749e-2
176.79289	4.60755e-2
178.88821	4.71239e-2
181.44104	4.82090e-2
183.81902	4.94200e-2
186.76656	5.07760e-2
189.71282	5.21861e-2
192.31914	5.34334e-2
195.60536	5.50062e-2
199.00701	5.65431e-2
201.49747	5.78443e-2
205.34901	5.97423e-2
208.29400	6.12064e-2
211.35105	6.27788e-2
215.25693	6.48029e-2
219.21333	6.71153e-2
221.35791	6.85059e-2
223.73716	6.96628e-2
225.94623	7.07474e-2
227.92993	7.16695e-2
230.31087	7.27543e-2
231.43982	7.34768e-2
233.99476	7.44719e-2
236.54463	7.56831e-2
239.03466	7.70023e-2
241.35451	7.82492e-2
243.67689	7.93880e-2

248.83337 8.12466e-2

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ITE-23, LE-301

TEMP, F	EXP, %
73.03923	-1.34618e-5
75.16658	1.45295e-4
77.53054	6.11854e-4
79.61208	1.27849e-3
82.96667	2.39583e-3
86.20935	3.64036e-3
88.93300	4.77716e-3
92.98709	6.36456e-3
95.88499	7.59167e-3
99.76731	9.19756e-3
103.59471	1.09123e-2
106.14783	1.21220e-2
109.22247	1.35483e-2
113.16550	1.52991e-2
116.76290	1.69963e-2
120.94585	1.92000e-2
124.65846	2.09150e-2
128.31409	2.26483e-2
130.69172	2.37133e-2
133.58921	2.49223e-2
136.71876	2.62396e-2
140.37232	2.78822e-2
143.73229	2.92353e-2
148.01802	3.09129e-2
150.10453	3.17972e-2
152.59446	3.27531e-2
155.42835	3.36902e-2
159.42587	3.53140e-2
163.01541	3.66666e-2
165.96574	3.76760e-2
169.03459	3.88483e-2
172.16622	4.02563e-2
175.05998	4.13021e-2
177.67008	4.24935e-2
181.09117	4.40097e-2
183.87304	4.51827e-2
188.68278	4.71856e-2
192.68237	4.89000e-2
198.48066	5.14631e-2
204.16251	5.39538e-2
207.87057	5.54694e-2
209.90630	5.66439e-2
212.69397	5.80707e-2
215.71536	5.96784e-2
218.21439	6.10333e-2
222.04800	6.30201e-2
225.71026	6.50436e-2
229.08470	6.70314e-2
231.52966	6.85315e-2
235.13162	7.04281e-2
237.57326	7.17831e-2
240.07146	7.31017e-2
243.03380	7.46370e-2
245.94039	7.62450e-2
248.26310	7.74189e-2
250.59078	7.88104e-2
251.98317	7.94603e-2

CTE-24, LE-3011

TEMP, F	EXP, %
75.93400	-8.90500e-5
77.30607	1.67048e-4
80.27335	9.51030e-4
83.17709	1.98811e-3
84.94195	2.62487e-3
88.00836	4.06023e-3
91.02345	5.24224e-3
93.86496	6.47816e-3
96.53245	7.78606e-3
99.19863	9.14823e-3
101.75215	1.04197e-2
104.59147	1.17460e-2
107.31333	1.31807e-2
109.24173	1.41795e-2
111.22799	1.51604e-2
112.87364	1.59778e-2
115.42497	1.73398e-2
117.52171	1.85018e-2
119.10513	1.95180e-2
121.82655	2.09707e-2
123.86543	2.21507e-2
126.69995	2.36760e-2
129.76417	2.52018e-2
133.79324	2.71999e-2
137.53869	2.90527e-2
140.65815	3.06690e-2
143.89245	3.22856e-2
145.13788	3.30298e-2
147.63309	3.43374e-2
150.87002	3.58454e-2
153.25389	3.70080e-2
156.15195	3.82802e-2
158.70284	3.96603e-2
160.91836	4.06597e-2
163.47494	4.18046e-2
166.31688	4.30224e-2
169.89443	4.46940e-2
172.11038	4.56754e-2
174.32372	4.67653e-2
176.37003	4.76378e-2
178.35891	4.85101e-2
181.14300	4.97459e-2
184.49783	5.11276e-2
186.20047	5.19632e-2
188.24590	5.28719e-2
190.97125	5.41619e-2
193.35686	5.52521e-2
195.28876	5.61063e-2
197.79009	5.71606e-2
199.94775	5.81780e-2
203.46918	5.97952e-2
207.05153	6.12678e-2
209.60679	6.24670e-2
211.36816	6.32484e-2
213.18477	6.41205e-2
216.53131	6.58458e-2
220.10666	6.76078e-2
222.94468	6.89884e-2
226.01196	7.03876e-2
229.69255	7.25478e-2
233.04127	7.41827e-2

CTE-24

238.99394	7.73786e-2
242.40183	7.89413e-2
244.95054	8.04117e-2
247.50580	8.16109e-2
249.82481	8.30808e-2
251.76020	8.37903e-2

CTE-25, LE-3013

TEMP, F	EXP, %
72.95165	-1.80547e-4
73.81170	-1.26382e-4
75.76149	-7.22188e-5
77.08004	5.41641e-5
78.39808	2.88875e-4
80.28822	8.30516e-4
81.83407	1.40826e-3
83.55206	1.96796e-3
84.92653	2.40127e-3
87.04498	3.17762e-3
88.47629	3.71926e-3
90.42252	4.53173e-3
91.79639	5.09142e-3
93.17043	5.61501e-3
94.42959	6.17470e-3
95.80355	6.71635e-3
97.69259	7.49270e-3
100.09519	8.82875e-3
102.44120	1.00023e-2
103.92774	1.09953e-2
105.70157	1.18799e-2
107.47556	1.27285e-2
108.96278	1.35771e-2
110.44992	1.44437e-2
112.45282	1.54006e-2
114.51172	1.66464e-2
116.62925	1.76213e-2
118.86013	1.88852e-2
120.46206	1.97337e-2
123.03647	2.11240e-2
125.21041	2.22975e-2
128.30033	2.38322e-2
130.98928	2.52585e-2
133.27768	2.64862e-2
137.22596	2.84361e-2
139.40092	2.93930e-2
143.06268	3.12888e-2
145.98096	3.27331e-2
148.72785	3.40331e-2
150.44458	3.48636e-2
153.30491	3.64343e-2
154.45004	3.68496e-2
156.28147	3.76801e-2
158.22778	3.84745e-2
160.97561	3.95759e-2
162.97877	4.04786e-2
165.72651	4.15980e-2
167.78719	4.24646e-2
171.67938	4.41437e-2
175.28549	4.56784e-2
177.80364	4.68339e-2
182.32504	4.88740e-2
186.50189	5.10045e-2
189.59214	5.24669e-2
191.30912	5.32433e-2
193.48400	5.42182e-2
196.00224	5.53557e-2
197.77640	5.61681e-2
202.12582	5.81903e-2
204.18523	5.93277e-2
206.53183	6.03749e-2

CTE-25

[illegible]	6.21443e-2
[illegible]	6.26317e-2
213.39797	6.38594e-2
215.74397	6.50330e-2
217.51746	6.59899e-2
220.32061	6.75246e-2
222.66678	6.86620e-2
225.35632	6.99619e-2
228.90473	7.15688e-2
231.76481	7.31937e-2
234.05372	7.43131e-2
237.25792	7.59380e-2
239.26125	7.68047e-2
240.97780	7.76713e-2
243.66649	7.91518e-2
246.12721	8.03253e-2
248.12969	8.13725e-2
250.99027	8.28891e-2
252.59246	8.36835e-2

ITE-26, LE-3014

TEMP, F	EXP, %
71.59867	-4.16472e-5
74.16953	3.03820e-4
76.39706	6.49176e-4
77.99536	9.76191e-4
80.21961	1.59363e-3
82.27219	2.21101e-3
84.60455	3.35451e-3
86.59751	4.17140e-3
90.46636	6.02281e-3
93.02892	7.05755e-3
95.59017	8.20113e-3
98.03719	9.32653e-3
100.71114	1.06152e-2
103.78324	1.21036e-2
106.28639	1.33197e-2
109.18792	1.47173e-2
112.26002	1.62057e-2
115.21877	1.76033e-2
117.83659	1.88014e-2
120.73833	2.01808e-2
123.12944	2.11974e-2
126.37146	2.28309e-2
128.87440	2.40652e-2
132.62880	2.59166e-2
136.95281	2.79858e-2
140.53948	2.95106e-2
143.15882	3.05816e-2
145.94831	3.17797e-2
149.02434	3.29416e-2
152.49809	3.43394e-2
155.80105	3.56646e-2
159.15948	3.71349e-2
163.94324	3.90411e-2
167.75945	4.05115e-2
170.77695	4.17822e-2
174.82074	4.33616e-2
178.40850	4.47957e-2
181.88204	4.62117e-2
185.07230	4.73917e-2
187.91682	4.87712e-2
190.82010	5.00237e-2
194.00752	5.14396e-2
197.93577	5.31096e-2
201.52309	5.45800e-2
205.10845	5.62137e-2
208.69228	5.79743e-2
212.10509	5.96805e-2
215.00662	6.10781e-2
216.94126	6.19857e-2
219.78535	6.34014e-2
222.97255	6.48354e-2
225.70132	6.63237e-2
228.77123	6.79934e-2
233.26450	7.02623e-2
236.27720	7.19320e-2
238.78057	7.31300e-2
243.33303	7.52355e-2
246.46213	7.67421e-2
249.47876	7.80853e-2
252.43795	7.94467e-2

ITE-27. LE-3015

TEMP. F	EXP. %
71.70249	-1.05397e-6
73.14130	3.56378e-4
74.46439	6.59873e-4
77.11625	1.50218e-3
79.47903	2.21870e-3
81.55929	3.08096e-3
83.29501	3.89001e-3
86.47433	5.25562e-3
90.18026	7.10831e-3
90.40733	7.03517e-3
93.01288	8.33021e-3
95.78829	9.55229e-3
99.54445	1.11151e-2
102.03341	1.23200e-2
105.16032	1.38849e-2
108.40034	1.53952e-2
110.77184	1.64737e-2
115.92224	1.89192e-2
118.47015	2.01963e-2
122.05992	2.19770e-2
128.18976	2.47089e-2
130.85076	2.59314e-2
134.66151	2.73854e-2
137.54872	2.84985e-2
143.60392	3.05066e-2
147.64435	3.19962e-2
150.81932	3.31808e-2
154.39690	3.44546e-2
156.70858	3.54247e-2
160.11367	3.66629e-2
162.94280	3.77399e-2
166.86403	3.90307e-2
170.66999	4.02857e-2
174.41743	4.14866e-2
177.12823	4.24011e-2
180.64642	4.35846e-2
184.22400	4.48584e-2
187.68847	4.61869e-2
192.30922	4.80185e-2
196.52780	4.97790e-2
199.76172	5.10359e-2
204.15540	5.29407e-2
208.37572	5.47736e-2
211.32754	5.61942e-2
214.62694	5.77948e-2
218.33199	5.96113e-2
220.82356	6.09248e-2
223.89458	6.25442e-2
226.55820	6.38753e-2
229.39779	6.53868e-2
232.46750	6.69519e-2
236.52101	6.89845e-2
239.18289	7.02431e-2
242.48054	7.17713e-2
245.71838	7.31910e-2
249.12870	7.46464e-2
252.42766	7.62288e-2
253.18264	7.66971e-2

CTE-28, LE-3016

TEMP, F	EXP, %
74.61248	-1.01373e-4
78.81131	-5.59960e-5
80.81079	6.91396e-4
85.14807	2.54937e-3
89.83700	4.06378e-3
96.62800	3.93356e-3
101.17098	4.03406e-3
105.48590	4.02532e-3
110.08538	4.18031e-3
116.98358	4.46715e-3
121.35500	4.51291e-3
128.25559	4.67290e-3
133.31905	4.62954e-3
138.16196	4.07826e-3
142.08853	3.30751e-3
146.82765	2.15794e-3
151.34246	6.99801e-4
155.62887	-8.49456e-4
160.61483	-2.88651e-3
165.19537	-4.77946e-3
169.55433	-7.12598e-3
174.31462	-9.39912e-3
178.32499	-1.15651e-2
182.62165	-1.36580e-2
187.08747	-1.55694e-2
192.18405	-1.73706e-2
196.92522	-1.86289e-2
203.27409	-1.97206e-2
209.78393	-2.01958e-2
216.51604	-2.02536e-2
223.41902	-2.02205e-2
227.38911	-2.02481e-2
232.46145	-2.07626e-2
239.27191	-2.19258e-2
245.56564	-2.31445e-2
252.14223	-2.41088e-2

CTE-29, LE-3017

TEMP F	EXP, %
74.26685	-1.43999e-5
78.63273	1.21606e-3
83.10283	2.71855e-3
87.94777	4.91063e-3
92.08583	6.10398e-3
98.39246	6.03831e-3
105.44056	6.06611e-3
110.07438	6.28357e-3
117.10104	6.87263e-3
121.84600	7.18107e-3
128.65106	7.57007e-3
132.94799	7.60512e-3
139.93809	7.65080e-3
144.70243	7.45229e-3
151.27493	6.42794e-3
155.78526	5.37734e-3
160.71331	3.89380e-3
166.93796	1.47375e-3
173.40496	-1.28939e-3
178.52013	-3.17057e-3
185.43724	-5.71465e-3
189.44086	-7.00264e-3
196.14664	-8.51539e-3
202.70530	-9.17763e-3
211.59328	-9.30556e-3
218.12635	-9.29790e-3
222.80918	-8.86295e-3
229.69771	-7.65875e-3
234.02081	-6.80873e-3
240.92387	-5.98475e-3
245.38510	-5.74986e-3
252.26060	-5.70464e-3

DTE-30, LE-301B

TEMP, F	EXP, %
70.58284	1.23112e-4
74.72582	1.13334e-3
79.56231	2.81171e-3
83.65188	4.49032e-3
87.97290	6.43981e-3
90.21621	6.85455e-3
92.57193	6.85380e-3
95.15365	6.22074e-3
99.22935	5.60527e-3
105.95056	5.40441e-3
112.55892	5.54680e-3
119.05074	5.41826e-3
123.75988	5.03742e-3
130.65018	4.29459e-3
138.16814	2.82902e-3
144.64926	9.30256e-4
149.29297	-7.69220e-4
156.05592	-3.57126e-3
160.58221	-5.68616e-3
165.05082	-7.83717e-3
170.08931	-1.07651e-2
173.86866	-1.28797e-2
178.96515	-1.57174e-2
182.40075	-1.76693e-2
187.09810	-2.00011e-2
191.79621	-2.22063e-2
195.92445	-2.36347e-2
203.89879	-2.56423e-2
210.03997	-2.67462e-2
216.86976	-2.79948e-2
223.87224	-2.91892e-2
232.30688	-3.10886e-2
239.19391	-3.23734e-2
246.02796	-3.29175e-2
251.88841	-3.29374e-2

CTE-31, LE-3019

TEMP, F	EXP, %
72.75101	-9.13473e-5
77.56862	9.18873e-4
81.92627	2.68806e-3
88.00311	5.84789e-3
90.98466	7.05744e-3
96.72131	7.21820e-3
103.83499	7.25205e-3
110.37514	7.15961e-3
116.80017	7.35629e-3
121.61878	7.62575e-3
128.10137	7.67787e-3
134.87080	7.72990e-3
141.92730	7.61923e-3
149.27224	6.31602e-3
156.04447	4.29031e-3
162.81807	1.23476e-3
167.06600	-7.35928e-4
173.03620	-3.61054e-3
176.88294	-5.87019e-3
181.93507	-8.61804e-3
187.38903	-1.15466e-2
193.70322	-1.42588e-2
200.53318	-1.65555e-2
206.21423	-1.77136e-2
212.52554	-1.82757e-2
221.18834	-1.83689e-2
227.84292	-1.82265e-2
234.61250	-1.82828e-2
241.15256	-1.83030e-2
245.85677	-1.82865e-2
251.13612	-1.93541e-2
251.59800	-2.15404e-2

CTE-32, LE-3020

TEMP, F	EXP, %
74.88294	-2.26846e-4
79.02058	6.73826e-4
85.51978	2.89392e-3
90.12353	4.84460e-3
94.37193	5.14740e-3
99.12924	4.32655e-3
105.55369	3.95653e-3
112.43988	3.98444e-3
120.81838	4.06489e-3
130.05714	4.07185e-3
137.45917	4.00857e-3
144.68333	3.09418e-3
151.32917	1.51029e-3
157.97295	-3.81522e-4
167.07678	-3.38122e-3
174.34388	-6.45115e-3
180.52301	-9.17562e-3
186.93361	-1.16105e-2
193.46214	-1.35746e-2
200.62600	-1.49237e-2
210.14949	-1.52431e-2
219.15921	-1.51634e-2
225.53612	-1.40662e-2
232.14243	-1.29874e-2
239.20611	-1.21627e-2
245.74824	-1.20981e-2
250.56816	-1.21402e-2

CTE-33. LE-3021

TEMP, F	EXP, %
72.48621	1.33400e-6
77.13782	4.68933e-4
83.74196	2.79821e-3
88.22128	4.74889e-3
92.47090	5.52417e-3
96.89280	4.72593e-3
103.43951	4.23395e-3
110.27335	4.30244e-3
116.53292	4.46169e-3
121.18453	4.47715e-3
127.96094	4.49143e-3
133.07197	4.30770e-3
140.19295	3.50794e-3
144.55742	2.58314e-3
151.62098	6.44047e-4
158.16768	-1.60220e-3
165.00153	-4.37309e-3
171.89280	-7.16209e-3
178.09494	-1.00230e-2
183.20597	-1.20514e-2
189.35068	-1.39538e-2
196.06967	-1.53683e-2
203.30551	-1.58787e-2
209.62251	-1.59546e-2
214.67611	-1.55958e-2
221.10796	-1.42430e-2
227.71209	-1.27456e-2
234.83307	-1.13028e-2
241.15007	-1.06915e-2
245.74425	-1.06036e-2
250.56814	-1.05702e-2

ITE-34. LE-3022

TEMP. F	EXP. %
75.05274	-2.06210e-4
79.58751	-1.26753e-4
85.99210	1.73786e-3
90.32996	3.55324e-3
94.46953	3.97712e-3
99.33466	3.31460e-3
105.98946	3.22625e-3
112.76175	3.28224e-3
119.14018	3.75496e-3
126.02790	3.84682e-3
132.85553	3.79421e-3
140.08176	3.57794e-3
144.71805	2.95213e-3
151.63361	1.47118e-3
158.53897	-5.52060e-4
167.54772	-3.62887e-3
174.15123	-6.44680e-3
180.98325	-9.31951e-3
189.76146	-1.24500e-2
196.27467	-1.39661e-2
203.37595	-1.47244e-2
212.61289	-1.48190e-2
219.27958	-1.42746e-2
225.79078	-1.28441e-2
234.55035	-1.08586e-2
241.57763	-9.44749e-3
246.34941	-8.97090e-3
250.48218	-8.90855e-3

CTE-35, LE-3023

TEMP, F	EXP, %
72.84782	-7.34690e-5
77.61201	-4.30125e-5
81.75192	1.30972e-3
86.06782	3.36827e-3
90.32544	5.26396e-3
94.28694	5.45831e-3
98.93226	4.72858e-3
105.93409	4.59341e-3
112.36291	4.63996e-3
118.79338	4.99426e-3
126.02674	5.22087e-3
132.62834	5.37583e-3
142.15595	5.29192e-3
149.09698	4.52321e-3
155.74752	3.10314e-3
162.62347	9.04370e-4
169.72532	-1.98259e-3
176.25301	-4.90508e-3
182.66463	-8.06276e-3
189.53534	-1.12391e-2
196.40983	-1.37094e-2
203.23101	-1.54193e-2
210.11435	-1.62423e-2
218.95358	-1.62529e-2
225.55459	-1.62066e-2
232.10365	-1.51464e-2
238.82393	-1.42675e-2
245.88587	-1.38958e-2
252.42998	-1.37589e-2

ITE-36, LE-3024

TEMP, F	EXP. %
73.25289	1.43423e-3
75.37284	2.24266e-3
77.49242	2.96102e-3
80.47237	4.23693e-3
83.16620	5.49512e-3
85.74562	6.75343e-3
88.84092	8.26341e-3
91.82174	9.75549e-3
94.80270	1.12835e-2
97.72580	1.26496e-2
101.50889	1.44831e-2
103.62949	1.54537e-2
105.63553	1.63883e-2
108.04318	1.76108e-2
110.96657	1.90489e-2
113.37436	2.03074e-2
115.89701	2.16738e-2
118.41907	2.28962e-2
121.68651	2.45321e-2
125.41312	2.65458e-2
127.99304	2.79302e-2
130.97328	2.92781e-2
133.72504	3.07164e-2
136.53264	3.18124e-2
139.62722	3.31422e-2
143.63814	3.47233e-2
146.56095	3.60173e-2
149.54075	3.72571e-2
153.15136	3.88747e-2
156.47535	4.03484e-2
159.05434	4.14986e-2
161.80567	4.28288e-2
166.38946	4.46074e-2
169.94243	4.61169e-2
172.86502	4.73569e-2
174.29840	4.81480e-2
176.47700	4.93167e-2
179.91606	5.09524e-2
183.69858	5.26418e-2
186.96572	5.42056e-2
189.83161	5.55717e-2
193.04126	5.70635e-2
196.82400	5.88070e-2
200.95027	6.06221e-2
204.33190	6.22039e-2
207.88631	6.40736e-2
210.92397	6.54756e-2
213.84765	6.69857e-2
216.94360	6.86578e-2
222.39050	7.16786e-2
226.57659	7.41422e-2
230.30378	7.63000e-2
233.62871	7.80079e-2
238.04370	8.04893e-2
241.36855	8.21791e-2
244.52236	8.40133e-2
248.13290	8.56128e-2

CTE-37, LE-3025

TEMP, F	EXP, %
74.70755	5.82031e-4
76.59617	1.05267e-3
79.22586	1.93877e-3
82.08289	3.00541e-3
84.65470	3.92751e-3
86.93877	4.90343e-3
90.53641	6.42158e-3
92.76100	7.55973e-3
94.87214	8.58959e-3
98.12554	1.00893e-2
101.09326	1.14806e-2
104.00541	1.27277e-2
106.57239	1.40284e-2
108.91272	1.50946e-2
111.88044	1.64859e-2
114.56133	1.78589e-2
116.89982	1.90693e-2
121.69530	2.12017e-2
124.49194	2.25027e-2
126.89151	2.34246e-2
129.74533	2.47437e-2
131.80044	2.56653e-2
134.54173	2.68039e-2
136.59706	2.77075e-2
139.50875	2.89906e-2
142.13545	3.01111e-2
144.30515	3.10508e-2
146.47623	3.18824e-2
149.79003	3.31478e-2
152.13335	3.39796e-2
155.67726	3.52091e-2
158.01804	3.62392e-2
163.16144	3.81014e-2
166.58961	3.94030e-2
171.10147	4.12647e-2
173.55823	4.22047e-2
176.75767	4.34340e-2
179.89878	4.47353e-2
183.15654	4.58925e-2
185.27113	4.66518e-2
188.58493	4.79173e-2
192.63980	4.95981e-2
196.75093	5.13692e-2
200.51852	5.30679e-2
203.77123	5.46217e-2
209.08042	5.69890e-2
214.84317	5.98076e-2
218.78023	6.17227e-2
222.77309	6.37642e-2
225.22663	6.49567e-2
227.96356	6.64379e-2
231.78602	6.83350e-2
234.06825	6.94551e-2
236.17663	7.07014e-2
237.54256	7.16403e-2
239.82479	7.27605e-2
242.78883	7.44403e-2
244.89951	7.55063e-2
247.63736	7.69154e-2
[illegible]	[illegible]

251.17552	7.85958e-2
252.83035	7.93908e-2

CTE-37

CTE-3B, LE-302B

TEMP, F	EXP, %
74.54082	3.45628e-4
76.84587	1.06523e-3
79.15275	1.89349e-3
81.69286	2.95671e-3
83.82897	3.85777e-3
86.42884	5.06575e-3
88.96955	6.16519e-3
90.87820	7.17539e-3
94.16715	8.45437e-3
97.34358	9.86036e-3
100.23036	1.10858e-2
102.83083	1.23300e-2
105.25750	1.34659e-2
108.84126	1.52332e-2
112.08017	1.69470e-2
114.73918	1.82635e-2
116.76308	1.93097e-2
118.73087	2.04284e-2
122.48386	2.20324e-2
125.02853	2.33673e-2
127.74486	2.46837e-2
130.28466	2.57288e-2
133.22846	2.69361e-2
135.54049	2.80722e-2
138.59894	2.92792e-2
141.48754	3.06134e-2
145.64270	3.22709e-2
147.72089	3.31358e-2
150.43418	3.42711e-2
154.06798	3.56037e-2
156.72183	3.66124e-2
159.95315	3.78733e-2
162.43533	3.89005e-2
164.45528	3.97112e-2
168.49034	4.10430e-2
172.06378	4.21946e-2
175.52348	4.34007e-2
177.25500	4.41034e-2
180.02349	4.51118e-2
182.21451	4.58679e-2
184.35093	4.67871e-2
185.73700	4.73999e-2
187.98655	4.82283e-2
190.11994	4.89664e-2
191.96732	4.97413e-2
194.33394	5.07143e-2
196.52556	5.15066e-2
198.77572	5.23712e-2
202.17962	5.36681e-2
204.08584	5.45334e-2
206.96989	5.55959e-2
209.62737	5.68219e-2
211.88239	5.79762e-2
215.00392	5.95272e-2
217.49035	6.08079e-2
219.74445	6.19079e-2
222.80563	6.32779e-2
227.08515	6.55147e-2
229.33774	6.65242e-2
231.93365	6.74967e-2

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236.96049	6.98587e-2
239.61495	7.09036e-2
242.21602	7.21840e-2
244.93205	7.34823e-2
247.41453	7.45275e-2
249.31863	7.52660e-2

[illegible]TE-39, LE-30[illegible]

TEMP, F	EXP, %
73.33626	-1.93871e-4
75.39679	7.63665e-5
76.88483	3.28728e-4
78.77335	7.25440e-4
80.31803	1.28480e-3
82.20626	1.82599e-3
84.43731	2.71021e-3
86.15345	3.41400e-3
88.55608	4.38847e-3
90.84434	5.29073e-3
92.38873	5.99457e-3
93.81847	6.77069e-3
97.13633	8.14218e-3
99.59563	9.40559e-3
102.91298	1.10299e-2
105.60150	1.21849e-2
107.94648	1.33580e-2
110.23438	1.44409e-2
112.57964	1.54695e-2
114.46704	1.64261e-2
116.64051	1.74729e-2
118.64248	1.83933e-2
120.47240	1.94582e-2
123.61822	2.09743e-2
126.47795	2.24001e-2
128.47985	2.33566e-2
132.59837	2.51613e-2
134.37151	2.59915e-2
137.57465	2.74714e-2
139.51955	2.83015e-2
141.63580	2.93302e-2
142.95129	2.99800e-2
145.46821	3.10628e-2
148.95742	3.26329e-2
150.84529	3.33547e-2
153.47685	3.43652e-2
155.47907	3.51592e-2
157.82441	3.61517e-2
161.25699	3.74148e-2
163.14500	3.80644e-2
166.52043	3.92733e-2
168.23665	3.99410e-2
171.09715	4.09875e-2
173.95764	4.20341e-2
176.93272	4.30445e-2
179.44966	4.41092e-2
182.99657	4.54626e-2
185.68527	4.65272e-2
189.11756	4.79348e-2
191.46279	4.89815e-2
194.15124	5.01726e-2
197.41170	5.16164e-2
199.75667	5.27895e-2
201.81600	5.36557e-2
203.58904	5.45401e-2
206.16309	5.56771e-2
210.33868	5.75720e-2
213.19849	5.89617e-2
216.28683	6.05861e-2
218.23122	6.16691e-2
220.80484	6.30228e-2

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227.83955	6.66506e-2
230.01299	6.77154e-2
231.90038	6.86720e-2
234.58869	6.99353e-2
237.73424	7.15777e-2
241.39449	7.35090e-2
243.79683	7.46279e-2
245.74165	7.54942e-2
247.80080	7.64507e-2
249.34523	7.71365e-2
251.97643	7.83276e-2
252.54822	7.86886e-2

CTE-40, LE-3028

TEMP, F	EXP, %
73.97447	1.98371e-4
75.78177	7.13113e-4
78.16558	1.26121e-3
80.21870	2.09959e-3
82.26829	2.86582e-3
84.55573	3.79331e-3
86.08541	4.50786e-3
88.43917	5.61549e-3
90.32518	6.56293e-3
93.08390	7.72278e-3
95.49425	8.81209e-3
97.90814	9.97357e-3
101.15318	1.16724e-2
103.26997	1.26368e-2
105.50525	1.36728e-2
107.63531	1.49078e-2
110.22692	1.61767e-2
112.58510	1.73746e-2
115.05912	1.85899e-2
116.65158	1.94124e-2
121.77467	2.18964e-2
124.61564	2.35611e-2
128.73870	2.55806e-2
132.97936	2.76537e-2
138.21475	3.00830e-2
141.84441	3.14192e-2
144.54477	3.25613e-2
147.12577	3.36137e-2
151.52027	3.53071e-2
154.92180	3.66805e-2
159.08199	3.82848e-2
162.36681	3.96226e-2
165.64809	4.08882e-2
169.62524	4.22769e-2
173.85174	4.40614e-2
176.97034	4.55263e-2
180.08806	4.69731e-2
183.37642	4.83831e-2
185.84247	4.94361e-2
189.48097	5.09526e-2
191.94968	5.20597e-2
194.65181	5.32379e-2
197.30797	5.46508e-2
201.48231	5.65438e-2
205.01915	5.83315e-2
207.60456	5.94742e-2
211.30408	6.10626e-2
214.25292	6.25825e-2
218.13901	6.44588e-2
221.79521	6.63362e-2
226.17293	6.88597e-2
229.58951	7.05398e-2
232.88141	7.20219e-2
235.81432	7.32170e-2
240.55011	7.48367e-2
243.70584	7.58864e-2
247.20020	7.68081e-2
250.33823	7.74970e-2
252.48595	7.79199e-2

CTE-41, LE-302P

TEMP, F	EXP, %
74.51046	1.96882e-4
76.56776	5.60141e-4
78.67942	1.12232e-3
81.18975	1.84755e-3
82.67010	2.48155e-3
85.12100	3.35137e-3
86.60161	3.96729e-3
89.39229	5.10859e-3
91.15752	5.85130e-3
94.06226	7.02885e-3
97.42056	8.53221e-3
100.88893	1.03430e-2
104.75676	1.22626e-2
108.50841	1.42906e-2
112.48870	1.63550e-2
115.61436	1.80932e-2
120.50232	2.07730e-2
122.77682	2.19500e-2
126.81334	2.40867e-2
129.94060	2.57165e-2
133.35806	2.70933e-2
137.39884	2.89408e-2
141.44389	3.04989e-2
145.03111	3.20205e-2
148.84590	3.36508e-2
153.00208	3.54441e-2
158.24206	3.75637e-2
162.06006	3.89770e-2
166.67619	4.06622e-2
169.92602	4.17496e-2
173.68619	4.31991e-2
176.53416	4.43404e-2
181.77921	4.61165e-2
182.97148	4.68588e-2
185.64731	4.80181e-2
189.17883	4.94312e-2
194.53260	5.16051e-2
198.40283	5.33620e-2
202.04415	5.51006e-2
206.99713	5.72561e-2
210.52705	5.87777e-2
214.39728	6.05346e-2
219.06218	6.27984e-2
222.70563	6.43924e-2
225.43848	6.55698e-2
228.80078	6.68020e-2
231.19918	6.73463e-2
233.59864	6.78183e-2
237.71909	6.81471e-2
242.12974	6.82229e-2
246.13959	6.82804e-2
249.06429	6.81020e-2

DTE-42, LE-3030

TEMP, F	EXP, %
74.93422	-3.45040e-5
76.65029	3.30029e-4
78.70812	8.58221e-4
81.79091	1.89553e-3
86.01317	3.46023e-3
89.71886	5.02446e-3
93.13727	6.60659e-3
97.35428	8.49799e-3
101.51505	1.03167e-2
106.86656	1.30440e-2
112.27459	1.58259e-2
116.19847	1.80982e-2
122.23582	2.10076e-2
126.50701	2.30987e-2
132.31886	2.57538e-2
138.07244	2.84634e-2
141.83260	3.02092e-2
145.93481	3.21005e-2
151.06725	3.41742e-2
154.25870	3.55927e-2
158.13746	3.71027e-2
164.12238	3.97035e-2
170.10935	4.21773e-2
175.24061	4.43236e-2
177.86335	4.54150e-2
183.10795	4.76522e-2
189.49261	5.03804e-2
193.93891	5.22902e-2
198.55623	5.42727e-2
202.94455	5.62187e-2
208.12650	5.87825e-2
211.53994	6.06732e-2
215.81142	6.27461e-2
219.62547	6.47098e-2
223.15780	6.63464e-2
227.09337	6.78927e-2
230.80169	6.92936e-2
234.85994	7.03500e-2
240.01195	7.12076e-2
244.83097	7.13571e-2
248.50498	7.13240e-2

ITE-43, LE-3031

TEMP, F	EXP, %
73.85816	1.84069e-4
76.09509	5.23937e-4
78.33241	1.06212e-3
79.82413	1.51106e-3
82.98012	2.66114e-3
85.16046	3.37969e-3
86.76705	3.91864e-3
88.71818	4.70959e-3
90.44007	5.55489e-3
94.11297	7.13706e-3
97.78653	9.04375e-3
99.91030	1.01409e-2
102.14918	1.14544e-2
106.74126	1.39009e-2
110.58687	1.58254e-2
114.08852	1.77863e-2
117.07346	1.94234e-2
119.25453	2.05026e-2
121.72212	2.14912e-2
124.47723	2.28942e-2
127.63376	2.43147e-2
132.51177	2.63822e-2
135.66859	2.79470e-2
138.82486	2.92413e-2
143.30190	3.15076e-2
147.26182	3.32517e-2
152.77057	3.53184e-2
156.67287	3.69183e-2
160.97654	3.85178e-2
164.53441	3.99198e-2
167.11700	4.10706e-2
171.36326	4.26340e-2
175.49492	4.42336e-2
179.85608	4.59051e-2
183.47129	4.73071e-2
187.54575	4.89789e-2
190.30018	5.00393e-2
194.71911	5.19271e-2
198.50695	5.36353e-2
202.12291	5.54159e-2
205.50876	5.68181e-2
209.69877	5.89225e-2
213.19984	6.05950e-2
215.89744	6.19079e-2
218.76720	6.32927e-2
221.69437	6.47135e-2
224.56409	6.60803e-2
227.26132	6.72129e-2
229.90089	6.81833e-2
233.74534	6.95309e-2
236.61405	7.03928e-2
241.48992	7.13966e-2
244.47214	7.16815e-2
248.71565	7.18747e-2